THE PICTURESQUE GEOGRAPHICAL READERS

BY

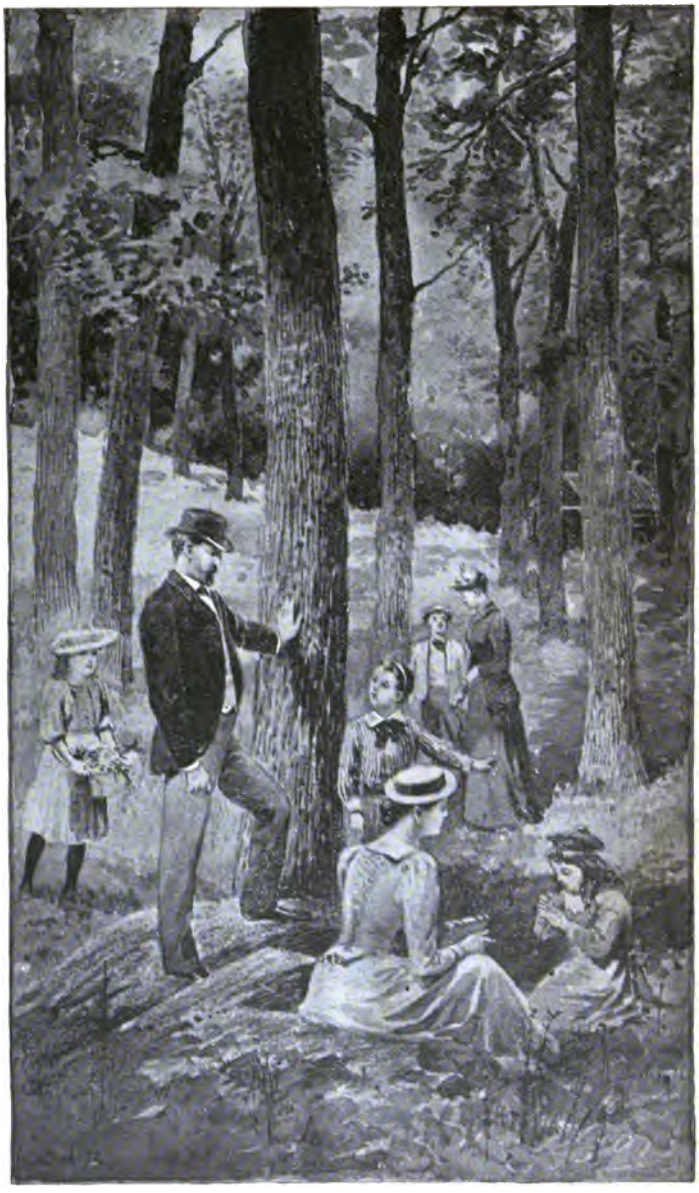
CHARLES F. KING

THIRD BOOK

THE LAND WE LIVE IN

PART I

201



IN THE MAPLE ORCHARD.

THE

PICTURESQUE GEOGRAPHICAL READERS

BY

CHARLES F. KING

AUTHOR OF "METHODS AND AIDS IN GEOGRAPHY"
MASTER DEARBORN GRAMMAR SCHOOL BOSTON

THIRD BOOK

THE LAND WE LIVE IN

PART I.

Supplementary and Regular Reading

IN

THE LOWER CLASSES IN GRAMMAR SCHOOLS
PUBLIC LIBRARIES AND THE HOME

BOSTON
LEE AND SHEPARD PUBLISHERS
10 MILK STREET
1894

The Land we Live In. — Part I.

University Press
JOHN WILSON AND SON CAMBRIDGE

PREFATORY NOTE.

"THE earth as the abode of man" has constantly been before the author while preparing this series of Geographical Readers, and everything that would serve to emphasize this has been called upon to contribute to these volumes. The narrative style has been continued in the present volume, and the same personages encountered in the former issues are again with the reader.

The Cartmell family study geography as it might be studied in school, save that the excursions are real in one case. Imaginary trips and voyages are among the most fascinating and reliable methods the teacher can employ in the class-room; and were the teacher to finish the study of every grand division or country with imaginary journeys, assisting in these with pictures, books, personal experiences and reminiscences, there would remain with the pupils not only a firmer appreciation of the facts learned in the study of the country, but a more vivid picture of what the country and its people really are; and these impressions would outlast all the technical and statistical knowledge acquired, — necessary perhaps, but evanescent.

A knowledge of the earth and its people can be secured by reading descriptions of places and their inhabitants, but pictures bring to the mind what mere verbal descriptions can never secure. The pictures in this volume, as in the previous ones, have been produced with the utmost care and are used solely to illustrate the text. They should be attentively observed by both teacher and pupils; those illustrating places should be studied with care, and the pupils be required to read the pictures as well as the text. The pictures employed to illustrate the various occupations and trades may demand some explanation from the teacher.

The chapters on manufacturing have been written only after a personal inspection of the workshops by the author. These chapters have been submitted to those who are expert in the business described, and may be considered to be reliable to date and place of observation. No pains have been spared to secure accurate information and pictures of the manufacturies written about.

So abundant has been the material that only representative occupations and places could be treated of; those selected, however, are so prominent as factors in the life of the people described that other places and occupations will be naturally discussed by the teacher and class.

It would be a natural sequence of the reading of this volume for the class to make a study of the various occupations in the town or county in which the school is. The teacher should visit, with the class, the factories and ware-

rooms, and should have practical demonstrations made of the various articles manufactured. This would be entirely in harmony with the industrial spirit of the age.

The illustrations are classified in order in the sub-heads in the Table of Contents. An index is added for the benefit of teachers and older readers. Numerous maps have been inserted in the text, enabling pupils to locate most of the places mentioned.

The author's acknowledgments for valuable material used in the preparation of this volume are due to so many writers that their names and books are given in the appendix. For convenience in use in the schoolroom, "The Land we Live In" is issued in two parts, — the first part covering the Eastern and Middle Atlantic States; the second part, which is to follow immediately, covering the other portions of the territory of the United States.

A list of suitable poems and their authors is also given for additional reading and study.

Special mention should be made in this connection of Mr. M. T. Pritchard, master of the Comins School, Boston, for valuable suggestions and assistance.

THE AUTHOR.

CONTENTS.

THE LAND WE LIVE IN.

PART I.

LESSON I.

ABOUT HOME.

ONE sunny afternoon in June, an expressman left a box at Mr. Cartmell's house in Lake View.

"I wonder what is in that box," said Nellie, coming up from the lawn where she had been playing tennis. Nellie had considerable curiosity for a girl only ten years old, but it rarely led her into mischief.

"Perhaps it is my new lawn-tennis set," said her elder sister Florence.

Their brother Fred, who sat on the piazza reading the "Youth's Companion," laughed at Florence's remark, and said, "Do you suppose a pair of racquets would go into a square box of that size? I think it contains something for father."

"No," said Florence, who had been examining the label on the box. "See what it says here, please."

Fred read this on the label, —

"GEORGE CARTMELL, LAKE VIEW."

George was riding with his father, and did not return until tea-time. Supper ended, all were eager for the opening of the box. The cover was quickly removed, and inside was discovered another box, on the top of which was a note addressed —

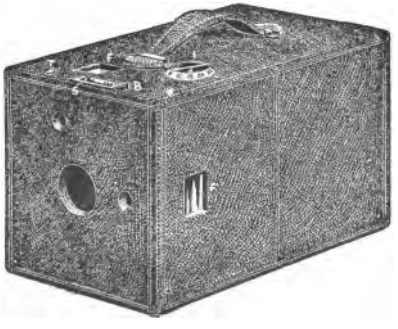
"OUR SON GEORGE."

This note George quickly opened and read aloud: —

DEAREST GEORGE, — In remembrance of your faithful and successful completion of your studies in the Grammar School, we give you this photographic apparatus.

PAPA.
MAMMA.

LAKE VIEW, June 19.



HAWKEYE.

Then the other box was lifted out, and it was found to be a Hawkeye camera in black leather case. There were also in the box a patent dry-plate holder, a ruby lantern, eight dozen dry plates, and several packages of chemicals for developing the pictures. There was also a triplex-jointed tripod.

ıt, and
getting

own the
he could
periments

take was
akes. He

Canada the
overcame
successful

him, he
nt Amy

AUNT AMY'S HOUSE.

The next day pictures were taken of the church and post-office. There are three churches in this town, but George naturally took a picture of the one which he had always attended.

The home of the Cartmells, Lake View, is a quiet, beautiful village, such as are seen in hundreds of New England towns. The town of Wilton, of which it is a part, is a good farming-section, containing uplands and intervales, hills and valleys, stretches of meadow and fine wooded slopes, where can be seen on all sides fields of growing grain and waving grass.

The water-power and railroads have built up a village at the eastern end of the town, and this section seems to

CHURCH AND POST-OFFICE.

grow very much faster than the other parts. A general view of the river and village is given on the first page.

This town is similar to many others about it in general size, area, variety of occupations, thrift and intelligence of the people.

On the following day Nellie observed George making careful preparation to take a number of pictures. "Where are you going, George?" she asked.

"I am now going to try to take pictures of the largest buildings in Wilton, — the town hall, library, etc. Father is going to help me."

"I wonder if I can go."

"I am willing; ask father."

Mr. Cartmell at that moment drove up from the stable with the carryall and span, and invited them all to go with him and George.

"How many dry plates have you, George?"

"Three."

"You had better take a few more. We may need them. I hope we shall obtain some good pictures."

LESSON II.

THROUGH THE TOWN.

THE centre of the town was nearly three miles from Lake View. There stood the town hall and one of the churches, and not far from these the library building, High School, and a large block containing the post-office and several stores.

They drove first to the town hall. George wished to take this picture alone, so he set up his tripod opposite the main entrance and experimented to get a good view, with the result indicated on the opposite page.

The rest of the party went inside into the main hall. As Florence and Nellie had not been in the hall during a town-meeting, Fred explained to them about the last meeting, showing where the different town officers were seated, where the moderator stood when presiding, where the ballot box was placed, etc.

"When was the last meeting held?" Florence asked.

"Last March. It is held at that time every year."

"Do you like to go, Fred?" Nellie asked.

"Certainly. We always have fun listening to the discussions. Don't you remember, Papa, how excited Sam Adams became in discussing the tax-rate last year; and how John Porter was stirred up about a new school-house in District No. 9? I shall never forget his loud tones and fierce gestures."

RAILROAD STATION.

TOWN HALL.

"This is very interesting," said Florence. "Please tell us, Papa, something more about a town-meeting."

"The town-meeting is called by the selectmen at least once a year. When the voters come together in this beautiful hall, the town-clerk calls the meeting to order; and the first business is to read the warrant which tells the items of business to be attended to. Then they elect a 'moderator,' or presiding officer, and next the regular town-officers for the coming year.

"After this has been done the amount of money to be raised by taxation is determined."

"How are the taxes divided up?"

"A small part of the taxes, called the poll-tax, is assessed upon persons. This is not usually over two dollars for each citizen old enough to vote. The bulk of the taxes is assessed upon the personal property and real estate. In Massachusetts property is assessed the first day of May."

"What else is done at a town-meeting, Papa?"

"The people vote on matters of public interest, such as the making of certain improvements in the town, the introduction of water, electric lighting, the building of a schoolhouse, a library-building, or a new bridge. They sometimes vote to remit the taxes of a new corporation for a time, to induce them to settle in the town."

George then came in and said he had succeeded in getting a good photograph of the building. At his suggestion they all drove to the other side of the town to see the new railroad-depot. The road was somewhat hilly, and afforded plenty of time for conversation.

"Papa, what do the selectmen do besides call the town-meeting?"

"They have the regular management of the public business. They generally grant licenses, draw jurors, and often assess the taxes. When the town-meeting is not in session, the selectmen are the 'government' of the town."

"How many are there?"

"Most towns have three. The first selectman is usually the agent and executive officer of the town."

"Who is the present town-clerk, Fred?" Florence inquired.

"John Parsons."

"What are his duties, Papa?"

"He keeps the records of the town; he records the votes passed in the town-meetings, the births, marriages, and deaths."

In a little while they reached the northern section of Wilton, and came in sight of the new station (see page 7). It was so much handsomer than they expected that a picture was at once called for. Mr. Cartmell and George succeeded after a time in getting a front view, which showed the outlines of the building in pleasant relief against the blue sky. The largest mill in town was also photographed.

On their way back to the centre of the town, Fred called the attention of the party to one set of town-officers not yet mentioned, — the school committee. He asked Miss Gray, his teacher, what they did besides elect the teachers.

"They select the text-books, and visit the schools. Each year they make a report of the condition of the schools. If the town is large enough, a superintendent is elected to look after the details of the schools and help the teachers in their work."

"Who is the superintendent in our town, Miss Gray?"

"Don't you remember, Nellie, the man who was in your schoolroom the other day?"

"Oh, Mr. Williams, who told the funny story about the dog and his master?"

"Yes. And the six members of the committee are Mr. Emerson, Mr. Goss, Mr. Bates, Mr. Clark, Mrs. Metcalf, and Miss Wilson."

"Are women ever elected to be superintendents?"

"Yes. A woman has been superintendent of schools in Bangor, Maine, and women quite frequently fill this position in the West."

Coming to a suitable place beside the road, George got out and watered the horses, for which kindness they

PUBLIC LIBRARY.

seemed properly grateful. After a few moments' rest the journey was resumed, and George asked his father for a good definition of a town.

"A town or township, in New England, usually means a section of land whose boundaries are defined by the legislature, and which has certain political and financial powers granted to it. Its rights and duties are defined by law. It can be fined or sued in the same manner as an individual."

"Is n't a town a part of a county, Papa?" Florence asked.

"Yes, just as the county is a part of the State, and the State a part of the Nation. Here the county has very few powers, and does very little business; but in the far West and in the South, the county is the important subdivision of the State, and raises the State tax, and the town does not have much business."

"What does a town do besides elect its officers?" Fred inquired.

"It taxes the citizens to support the schools, to take care of the roads and bridges, to support paupers, to pay the police, etc."

In a few minutes more they reached the town library, considered by many the handsomest building in the place. Fred took care of the horses, and Mr. Cartmell and George busied themselves in picture-taking. Miss Gray and the girls went into the library to get some books.

As the librarian was not busy she invited them all to come inside where the books are kept. The girls were delighted to go among so many books, to take them down from the shelves and look for pictures and maps. Some of the alcoves had in them books only for young people; others were devoted to history or travel or science. Miss Gray learned from the librarian that about forty thousand books had been purchased and given to the library since it was started twenty years before. About five hundred books are taken out every Saturday, which is the busy day.

"Have you heard, Miss Gray, of our new rule for the teachers?"

"No; what is it?"

"Teachers hereafter can take out four books on their own cards and keep them four weeks. They can get books on history, biography, and travel for school use in their classes, and retain them three weeks, with the privilege of renewing for two weeks more."

THEIR SCHOOLHOUSE.

"That is sensible and most helpful. I am so glad, for I shall get a lot of books for my class next week. Do you help the pupils when they come here for books?"

"We make a special effort to assist them in finding suitable reading-matter. After school and Saturdays I am very busy answering their questions."

Miss Gray thanked the lady for the information given, and each one selected a book for home reading. Even Nellie had her own card, and took out books as proudly as her older sister did.

The trustees of this library believed that habits of reading are formed early, and that libraries and their contents exist for the benefit and happiness of the greatest possible number.

When on their way home they came in sight of their own schoolhouse, where Miss Gray taught, Fred cried out, "I wish George would take a picture of the schoolhouse for our teacher." George was quite willing to do so, but his dry plates had all been used. He, however, took the picture the next day.

LANGUAGE LESSON.

The children are requested to write on any three of the following topics: —

1. George's Letter.
2. Lake View.
3. A Town-Meeting.
4. The Selectmen.
5. The School Committee.
6. The Public Library.

SPELLING AND DEFINING LESSON.

Study how to use these words in sentences: —

Lawn-tennis, piazza, camera, apparatus, packages, amateur, experiment, photograph, town-meeting, different, ballot, tax-rate, town-clerk, assessed, library, licenses, marriage, text-books, superintendents, Saturday.

LESSON III.

OUR PEOPLE AND THEIR BUSINESS.

"PAPA, we saw to-day, as we came home from school, a new shop opened on High Street," exclaimed Nellie.

"A Chinaman," added her brother, "by the name of Ah Wing, has set up a laundry where Sambo had his fruit store."

"Lake View, then, has a new race added to its population," said their father. "We have represented in town three of the four prevailing **races** in this country. How they look, where they live, and what they do will make a good subject for our talk this evening."

After supper they sat upon the piazza and discussed this subject, and looked over some pictures of people belonging to different races, and their costumes.

"How did the **Chinaman** look, Florence?"

"His skin was yellow, and his eyes close together and set slantingly. His hair was braided like a girl's."

"That is his cue. Usually in this country, and frequently in China, he wears it wound around his head, under his cap. His face is broad, and his forehead not very high. There are now about one hundred thousand Chinese in the United States. In the East most of them are engaged in the laundry business; in the West they work on the railroads, in the mines, or engage as domestic servants. As soon as they earn

and save a little money, they return to China, and live as rich men."

"The Chinese," added Miss Gray, "as seen in this country, are clannish, sad-faced, apparently home-sick, quiet in business, industrious, economical, minding their own business, regular and obedient as servants. Some

Scholar. Working People.

CHINESE.

of them have bad habits, such as smoking opium and gambling. A few in the large cities learn to read in English. Our government has recently forbidden their coming into this country."

"What would be the next race in population, George?" Mr. Cartmell asked.

"I suppose the **Indians**, of whom there are about two hundred and fifty thousand in the country."

"Indians are not very often seen in the East, except at summer resorts like Saratoga and Newport, where they sell baskets and fancy articles."

"Children," said their teacher, "come and see the photographs sent me recently of some Indian boys and girls, attending an industrial school in Carlisle, Pennsylvania. I was most interested in the Sioux group of these boys, who came from the Rosebud Agency in South Dakota. When they first came to the school, they looked as you see them in the lower photograph."

THE SAME WHEN THEY GRADUATED.

THREE SIOUX BOYS WHEN THEY ENTERED THE SCHOOL AT CARLISLE, PENNSYLVANIA.

"What names have they?" Nellie asked.

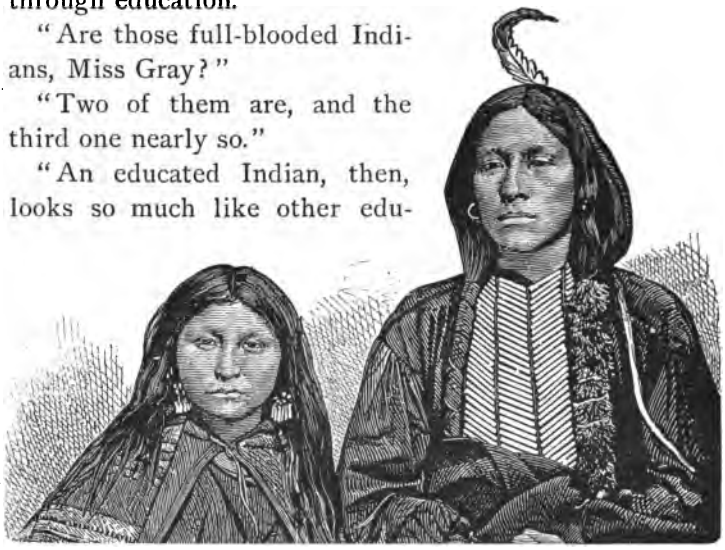
"The one at the left called himself 'Tim-

ber Yellow Robe;' his brother, in the centre, was called 'Wounded Yellow Robe;' the one on the right was 'Standing Bear.' They could not talk English then, and they dressed mostly in the present Indian costume. After eight years of training, they have adopted civilized names, they dress like American gentlemen, and are proud of their diplomas in the grammar grade. The upper picture shows what a change has been made in their appearance through education."

"Are those full-blooded Indians, Miss Gray?"

"Two of them are, and the third one nearly so."

"An educated Indian, then, looks so much like other edu-



INDIANS.

cated people, that the children must look in this book for types of savage Indians."

They looked at the pictures and were able to see the prevailing appearance of this race, which is noted for the reddish-brown skins, coarse straight hair, and high cheek-bones.

"What kind of business do they carry on, Papa?"

"They like to hunt and fish, but they look upon ordinary work as degrading, and 'only fit for woman.' The Indians of the West are so interesting in their habits and customs that we shall be obliged to talk about them again."

"Nellie, to what race does Sambo belong?"

NEGROES.

"The **Black Race**, I suppose."

"What is his appearance?"

"His hair is short and curly; his lips are thick, and his nose is flat."

"There are a great many Negroes in this country, — over seven millions, I believe. They are found in almost every part of the country, but they prefer the South, because it is warm there."

"*What do they do?* They work at all kinds of business. They are generally more industrious than the Indians and less so than the Chinese. In the North

they are especially employed indoors; they work in hotels and restaurants as waiters, for which they seem well adapted; in the South they work in the rice, cotton, and sugar fields, under the burning sun, without serious consequences from the heat. The Negroes of this land have made great improvement during the last twenty-five years; they have become better educated, richer in earthly possessions, and consequently more respected."

"Let me add," said Miss Gray, "that the Negro is remarkable for his faithfulness. He has shown this in times of peace and in times of war. He is lively, kind-hearted, and not very ambitious."

A WHITE MAN.

"The fourth, or **White Race,**" continued Mr. Cartmell, "is equal in number to five sixths of the more than sixty-two millions now counted in the United States. There are many different nationalities represented in this large number, owing to the activity of immigration. George may tell us the general appearance of his own race."

"The Caucasian has a white skin, an oval face, high

they are especially employed indoors; they work in hotels and restaurants as waiters, for which they seem well adapted; in the South they work in the rice, cotton, and sugar fields, under the burning sun, without serious consequences from the heat. The Negroes of this land have made great improvement during the last twenty-five years; they have become better educated, richer in earthly possessions, and consequently more respected."

"Let me add," said Miss Gray, "that the Negro is remarkable for his faithfulness. He has shown this in times of peace and in times of war. He is lively, kind-hearted, and not very ambitious."

"The fourth, or **White Race,**" continued Mr. Cart-
m[illegible] equal in

forehead, and fine straight hair, varying in color from red to black."

"Miss Gray, what do you consider some of the habits of the Americans?"

"Foreigners usually speak of us as very social, good talkers, witty, well-educated, self confident, boastful, extravagant, industrious, brave, and inventive. They also say: 'If the Eastern people are slow and cold they are firm and honest. The Southern people are generous and hospitable. The Western people are quick and progressive.'"

"The business of the world is done by the white race," said Mr. Cartmell. "This country is no exception to this rule. Every kind of business carried on in any part of the world is now in operation in our country, and managed by white men. In the Eastern and Middle States, where the land is not so well adapted to profitable farming, the people are largely engaged in manufacturing, mining, fishing, and commerce. But it must be remembered that within a few years the South and West have to a great extent engaged in all these occupations. Cotton factories and shoe shops abound in New England; woollen factories and iron mills and coal, iron, and oil mining employ millions of workers in the Middle States."

"What do the people farther south do, Papa?"

"They are *farmers* really; they make things grow in the ground. They raise tobacco in Virginia and Kentucky; rice in the Carolinas; fruit in Florida; cotton in the Gulf States; sugar in Louisiana; and cattle in Texas."

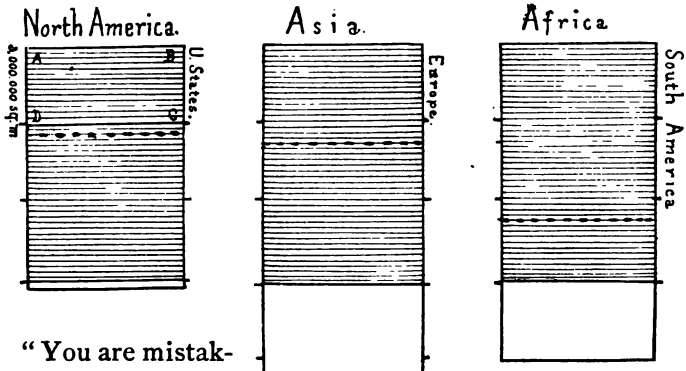
"Do cattle grow in the ground, Papa?"

"No, Miss Questioner, but they live on the grass which grows in the ground."

"What is the principal business in the Central States?" Fred asked.

Miss Gray replied, "Agriculture, grazing, and domestic commerce embrace most of the business; mining and lumbering the remaining part."

"I suppose," said George, "mining is the only occupation known in the Pacific States."



COMPARISON IN AREA.

"You are mistaken, my boy. Many more people are engaged in farming there than in mining; and the grain, fruit, and sheep raised by the farmers is worth more than the gold and silver taken out by the miners."

"How does the United States compare in size with other countries?" George asked.

"If you mean," replied his father, "size in reference to population, you will see by the latest census our country contains almost as many people as Russia, one third

more than Germany, and almost twice as many people as Great Britain or France. If you wish to compare the surface of the United States with the grand divisions, a simple diagram, such as I will draw for you, will help you to remember the facts. If we draw a small rectangle like A B C D in the figure and suppose that it represents three million square miles, the United States will extend to the heavy dotted lines below, and North America will occupy about three times as much surface; Europe is a little larger than the United States, and both are about the size of South America."

"What other comparison can you see?"

"Africa is somewhat larger than North America, and Asia is equal in area to both Africa and North America.

WESTWARD.

Oh, who has not heard of the Northmen of yore,
  How flew, like the sea-bird, their sails from the shore;
How westward they stayed not till, breasting the brine,
  They hailed Narragansett, the land of the vine?

COXE.

Westward the course of empire takes its way;
  The first four acts already past,
A fifth shall close the drama with the day;
  Time's noblest offspring is the last.

BERKELEY.

LESSON IV.

A PAIR OF SHEETS.

ONE day Nellie was helping Mrs. Cartmell make the beds. She did n't always like to do this work, especially when there was a chance for fun out of doors; but on this special occasion she was very good natured, and cheerfully did her part of the work.

"Do you change the sheets to-day, Mamma?"

"Yes, I change them every Saturday morning."

"Where did you get these sheets, Mamma?"

"I bought the cotton cloth in the store and made them."

"Oh, I remember going with you to the store. What great piles of white cloth we saw!"

"You saw other kinds of cotton cloth which were colored, such as ginghams, muslins, and calicoes. People use cotton and wear cotton every day of their lives."

"I wonder where all the **cotton** comes from, Mamma."

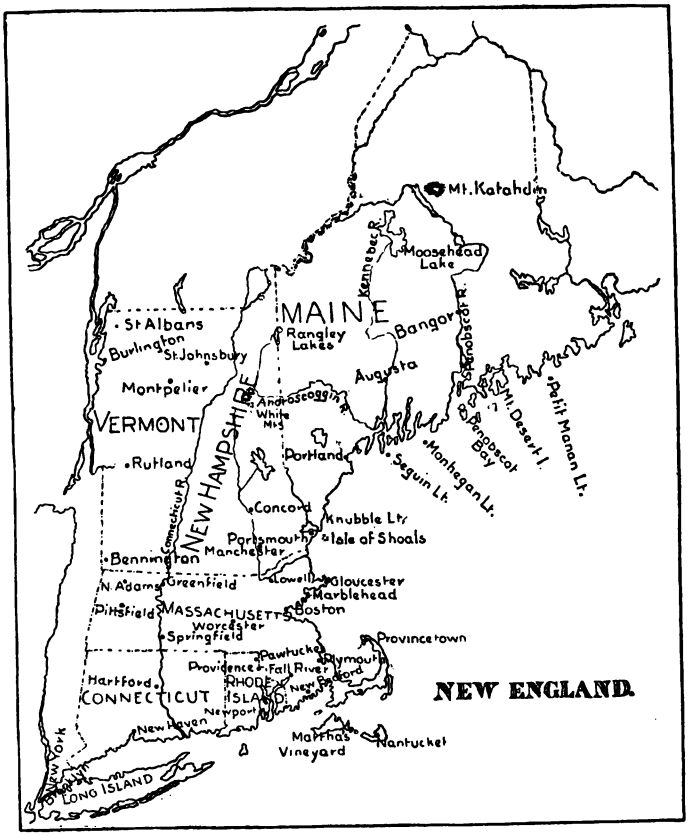
"It grows in a great many different parts of the world."

"Grows? What! is it a plant?"

"Yes, it is a plant. This shrub grows in India, China, and Egypt, but especially in the Southern States."

"How does it look when it is growing?"

"As soon as we get the beds made I will show you a picture of the cotton plant."


Mt. Katahdin
Moosehead Lake
Kennebec R.
MAINE
Rangley Lakes
Bangor
Penobscot R.
St Albans
Burlington
St Johnsbury
Montpelier
Augusta
Androscoggin R.
White Mts
Mt. Desert I.
Petit Manan Lt.
Penobscot Bay
VERMONT
NEW HAMPSHIRE
Rutland
Portland
Monhegan Lt.
Seguin Lt.
Concord
Knubble Lt.
Isle of Shoals
Portsmouth
Manchester
Connecticut R.
Bennington
N. Adams
Greenfield
Lowell
Gloucester
Marblehead
Pittsfield
MASSACHUSETTS
Boston
Worcester
Springfield
Provincetown
Pawtucket
Plymouth
Providence
Fall River
Hartford
RHODE ISLAND
Newport
CONNECTICUT
New Haven
Martha's Vineyard
Nantucket
New York
LONG ISLAND
NEW ENGLAND.

The work was soon finished, and Mrs. Cartmell showed the promised picture.

In the picture Nellie saw the leaf, bud, flower, and pod of the cotton plant. The picture was colored to represent the real shrub. The leaf was a dark glossy green, and the flower a pale yellow. The pod bursts open when it is ripe, and then it is white.

COTTON.

"Are the sheets, our shirts, common dresses, and stockings in summer made from this beautiful plant, Mamma? How can it be done?"

"Ask your papa to take you to a mill and show you how it is done."

Mr. Cartmell when asked was very glad to go with Nellie, and so all but George took a trip to Lowell, one of the oldest and one of the largest cotton manufacturing cities in the country. Mr. Cartmell's cousin, Mr. Burnside, received them in a very courteous manner at one of the mills, and showed them the different processes in making a piece of cotton cloth.

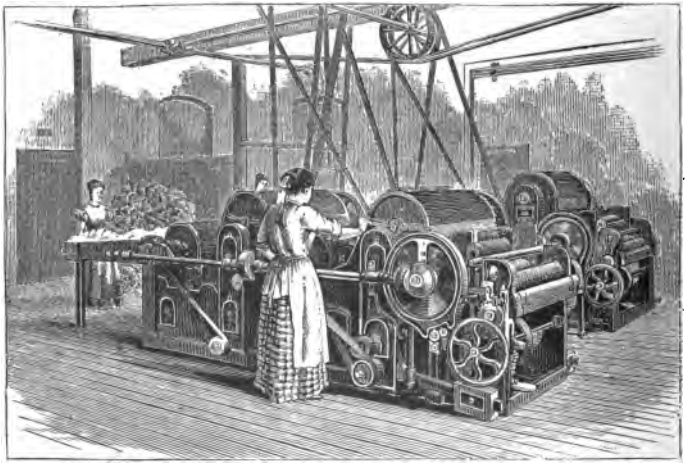
"Have you ever seen the plant growing, Mr. Cartmell?" was the first question asked by Mr. Burnside.

"Yes, I have seen it, but the children have not."

They were then shown several dry specimens of the

plant with roots, stem, leaves, and pods all affixed. The average height was three and a half feet. Each plant had upon it a dozen pods, or "bolls," as the planters call them.

After examining these carefully, Mr. Burnside led them to the mixing-room, where the bales of cotton are received as they come from the railroad.



PICKER.

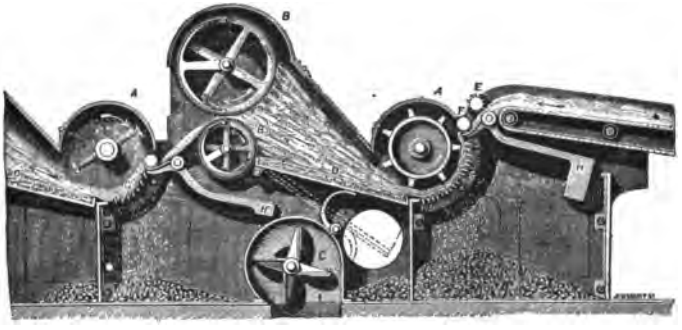
"I presume you know how the cotton is picked out of the pods and the seeds removed by the ginning process, the cotton pressed, and sent North.[1] In this room we open about sixty bales at a time, and the different varieties and grades of cotton fibre are thus carefully mixed to secure uniform quality, color, and length of fibre.

"Look, children, at this bale which has just been opened, and see how much dirt and how many leaves are

[1] See chapter on A Southern City, in Part II.

gathered with the cotton in the field; some seeds and other foreign substances are also left in the raw cotton. The first business after mixing is to get all these foreign substances out of the cotton, the fibres carefully separated from them, and laid parallel.

"This work is done by two machines somewhat alike, called the 'opener' and the 'picker.' In this room the cotton is fed into the *opener*, which takes out a good deal



INSIDE OF PICKER.

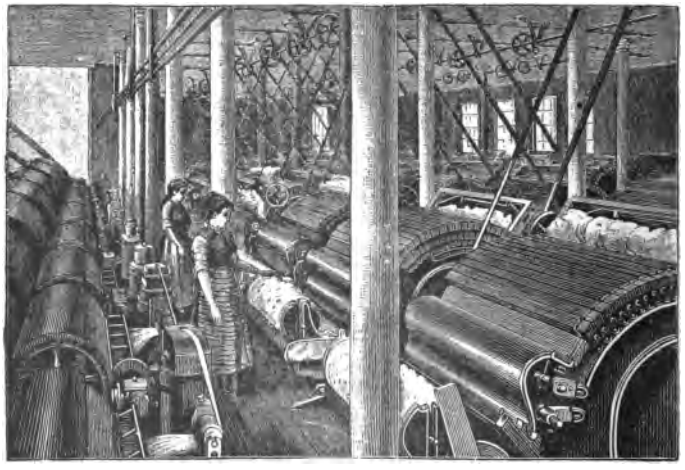
of the dirt and separates the fibre considerably. If the children will look under this roller they will see a heap of dirt."

Mr. Burnside then led the party into the next room, where several pickers were in operation. Sometimes men tend these machines; sometimes women. In Lowell usually men work on them. This machine, like the opener, continues to pull the cotton to pieces and to beat out more of the dirt, seeds, etc.

By looking at the side view of a picker, given above, it will be seen how the cotton passes over the rollers and gives up the dirt in so doing.

"Here, you see, Nellie," said Mr. Burnside, "is some more Southern soil. Notice also that the cotton issues from the picker in a continuous web or sheet, called a 'lap.'

"We will now, if you please, go to the next room below, where the carding is done."



THE CARDING ROOM.

Entering this room they saw that the ceiling was hung with lines of shafting and pulleys, all whirling with great speed. The floor was crowded with machines all alike, with barely room for the workers to pass. A multitude of belts connected the pulleys above with the machines below, all running at full speed.

"Oh, what a noise!" exclaimed the children in chorus.

Mr. Burnside had to speak very loudly to be heard. All gathered near him as he said,—

"The lap or roll of cotton we saw in the upper room, after coming out of the 'picker,' is placed in this machine, called the 'card.' Here the cotton lap, in which the fibres lay in all directions, comes in contact with large cylinders swiftly revolving and covered with fine wire teeth. These teeth are so fine and close that there are ninety thousand of them on a square foot of surface, which would be over six hundred to the square inch. The cotton from the 'lap' is fed to the cylinders; it passes between the sheets of teeth; these teeth comb or brush the cotton, and in so doing lay the fibres roughly parallel, as one straightens his tangled hair with a dressing comb.

"Standing by this part (foreground in picture) you can see the lap entering the machines on the right, and the other cotton coming from similar machines on the left in the form of a delicate rope called a 'sliver.'" (See page 28.)

"Mr. Burnside, do you spin the yarn directly from this sliver?" Mrs. Cartmell asked.

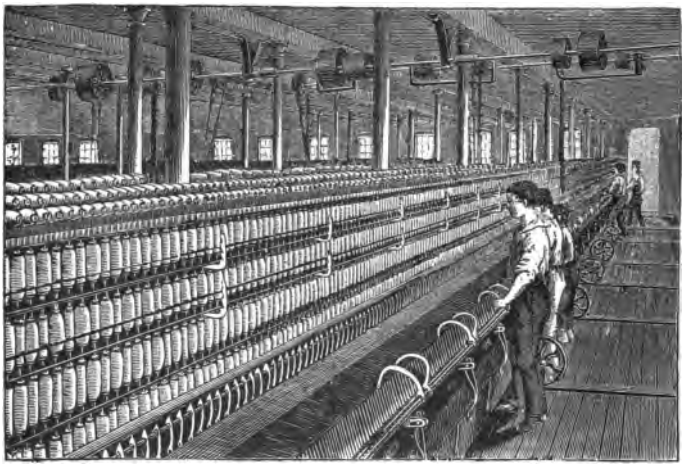
"No. This last operation is repeated a number of times; that is, several slivers are combined, and then drawn out to the size of the original one, so as to render the new sliver more uniform in thickness, and to place the fibres more perfectly in parallel order. The cotton has up to this point been doubled on itself eighty-one times. A number of similar operations are repeated upon the cotton before it is ready for spinning. When the yarn is ready to be spun into cloth, it will have been doubled three hundred and twenty-four times."

"That last statement, Mr. Burnside," said Mr. Cartmell, "astonishes me more than anything else I have learned to-day."

"We will now go to the next rooms to see the spinning. There are two kinds of spinning,—one for making the warp, that is, the long threads in the cloth; and one for making the filling, that is, the cross threads in the cloth.

"What do you call this great machine?" Fred inquired.

"This is the 'mule spinner,' or for short we often call it



MULE SPINNING.

the 'mule.' This one carries nine hundred spindles, and does more work in a day in spinning than one thousand of our mothers could with the old-fashioned spinning-wheel.

"All the nine hundred spindles are set, and run swiftly in one long, straight row, on a wheeled frame which backs off and returns with them all at once, as you see the men now doing, and as my mother did fifty years ago with one little spindle."

"Now, if you will follow me, I will take you to the room where the warp thread is made."

"In this room you see the ring-spinning, or the making from the soft cotton yarn, or *roving*, the more twisted thread used in the warp. As it is spun here it is wound on these small bobbins. From these small bobbins it is rewound on these larger bobbins, or spools; from the spools it is wound on this large roller, or beam, which is the same width as that of the cloth to be made."

"I suppose you weave it then," said Miss Gray.

"No; these threads must be starched to make them smooth and less liable to break. It therefore goes through the 'slasher,' where it is starched and dried; then girls with long slender hooks draw the threads through the harness and reed, the upper part of the loom. Then it is ready to make the warp in the loom."

Leaving the spinning, they all followed their conductor to see the next operation.

"We now enter the weaving room," said Mr. Burnside. "There are two hundred looms in this room. They stand pretty near together. One girl can tend four to eight of them. They are paid by the piece. A smart girl can earn a dollar and thirty-five cents a day.

"If we stand at this point we shall get a good view of the room. The thread or yarn for the warp has been dressed and wound on the yarn-beam, and is placed at this end of the loom. The filling is wound on small bobbins, and one of them is placed by the attendant in the shuttle. The shuttle is to the loom, Nellie, what the needle is to your mamma's sewing; it carries the thread.

"The warp strands are so arranged and so changed by means of the harness that the shuttle carrying the thread across, somewhat like a needle, is thrown back and forth by the machinery, as you see, between different sheds of

warp web. The shuttle goes across one hundred and fifty times or more in a minute."

"How long," asked Fred, "does one bobbin of thread last?"

"About five minutes in this loom. When the thread is finer, it will last longer."

Mr. Burnside stopped one of the looms and made it go slowly, so that all could see the process better. Nellie said that she understood it after this object lesson.

WEAVING.

"Does this finish the cloth?" Miss Gray asked.

"No, madam. The newly woven cloth has to pass through a machine which removes the nibs, loose threads, etc., clinging to the cloth. Then it is folded in one yard lengths, forty yards or more to a piece, and examined to detect any imperfections, and finally put up in bales for the market. If the cloth is to be whitened, it is sent to the *Bleachery*, where it goes through twenty distinct operations, and loses one tenth of its weight. If it is to be made into calicoes, etc., it goes to the *Print Works*."

LESSON V.

IN A MANUFACTURING TOWN.

JUST as Mr. Burnside said "Print Works," as related in the previous chapter, the bells on the different mills began to ring. The "power" was turned off, the wheels, belts, and pulleys came to a sudden standstill, and the "dreadful" noise ceased. The workers quickly left loom and picker for dinner. It was twelve o'clock in Lowell. Mr. Burnside invited the Cartmells to dine with him. When they reached the street, they found hundreds of people coming out of the many mills and hurrying to the boarding-houses or simple homes, for the noon-day meal.

While seated at the table Mr. Cartmell asked his host: "Can you tell me through how many different operations the raw cotton passes before the cloth is ready to make a pair of sheets?"

"You have seen this morning about ten operations. There are ten more in our mill, besides all the operations in the bleaching process, — in all about forty distinct operations."

"How many yards of cloth do you make in your mill in a week?"

"Over five hundred thousand yards."

"Is it possible?"

"The Merrimac Corporation, the largest in Lowell, makes twice as much."

"How much is made in Lowell in a week?"

"The seven corporations use about one and a half millions of pounds of cotton in a week, and produce almost five million yards each week. It is said that enough cotton and woollen cloth is made in this city every year to cover its entire area seven thicknesses deep."

After dinner Mr. Cartmell thanked his cousin for the kind attention given him and family, and for his hospitality.

"Now will you do one thing more, Mr. Burnside? Will you go to ride with us, and point out to us the places of interest in the **Spindle City**?"

"I shall be most happy to do so."

The party first visited Belvidere, which is an elevated suburb in the eastern part of the city, and where there are many fine residences; then they drove up Merrimac Street to Pawtucket Falls on the Merrimac River, and saw the dam across the stream which turns the water into the long canal, that runs like a great artery through the city, and supplies the immense water-power to the different mills; afterwards, crossing the river, they drove to the highest part of Centralville, where the reservoir stands, and from which so fine a picture is obtained of the numerous mills on the side of the Merrimac and Concord rivers.

"Mamma, what other kinds of cloth are made out of cotton besides sheetings?" Florence asked.

"Calicoes or prints, ginghams, muslins, and cambrics."

"Special mills," said Mr. Cartmell, "for making these goods and coloring them are to be found in Lowell, and

VIEW OF THE MILLS, LOWELL, MASSACHUSETTS.

in the other great manufacturing cities. These mills are usually known as 'Print Works.'"

"Are there other cities with great cotton mills?" Nellie asked.

"This Merrimac River," said Mr. Burnside, "supplies water-power to other cities, — Manchester, Nashua, and Lawrence. In the former place the Amoskeag is a very large corporation with four million dollars of capital, and operating two hundred and twenty-five thousand spindles and seventy-five hundred looms, making about fifteen hundred thousand yards of cloth every week.

"The largest mills in Lawrence are the Pacific, which make print goods. Some of the rooms in this mill are immense in area. There are great mills in Lewiston, Waterville, and Biddeford, Maine, and in Norwich, Connecticut, and in Chicopee and Salem, Massachusetts."

"You must not forget," interrupted Miss Gray, "the mills in New Bedford, Fall River, and Pawtucket."

"No, for we may wish to visit them sometime," added Mr. Cartmell.

As they rode along from one point of interest to another, Nellie exclaimed, —

"Mamma, I understand better than before how a pair of sheets are made."

"I am glad. What else is used to make them?"

Nellie could not think at first.

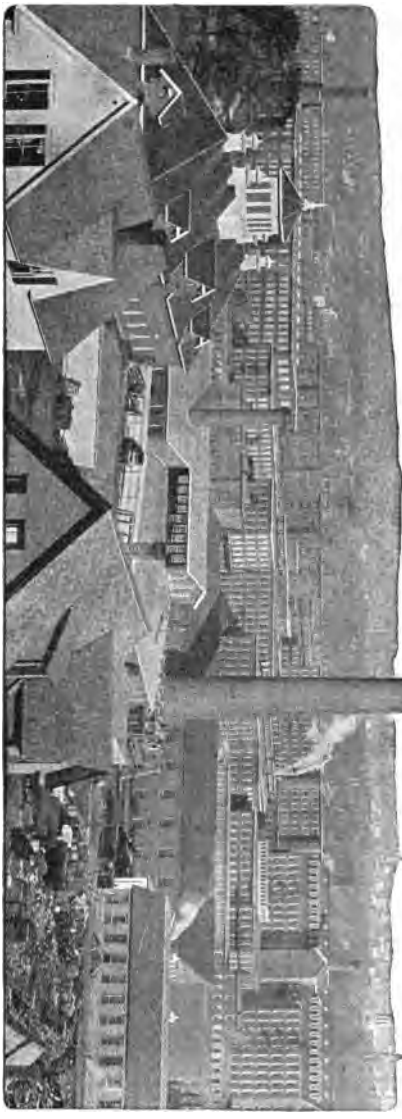
"Do you remember what I used in sewing the sheets?"

"I saw you use strong white thread and your sewing-machine."

"Do you know how **thread** is made?"

"No; please tell me."

"I once visited a great thread-mill in Newark, New



THE AMOSKEAG MILLS, MANCHESTER, NEW HAMPSHIRE.

Jersey, and saw the whole process. A long-fibre cotton is used for making thread, called sea-island cotton, which grows off the coast of the Carolinas. This cotton is treated in the same manner as that we have seen to-day, till it is made into yarn and wound on bobbins, each one carrying a pound of yarn. The yarn is doubled and twisted; then it is tripled, — that is, three strands are united, — and again twisted. From these close-wound bobbins it is reeled off into loose 'hanks' for washing, bleaching, and dyeing.

"These hanks, after the washing, etc., are rewound on large bobbins and sent to the spooling room. Here the end of the thread is attached to the spool, and the spool is made to revolve in the machine so as to wind the thread with great precision and care. When exactly two hundred yards have been wound on the spool, the machine cuts a slit in the edge of the spool, draws the end

REWINDING.

of thread into the slit, and then cuts off the thread. Hundreds of spools are wound at once by one machine."

"I suppose the spool of thread is now finished, Mamma."

"Not quite. The spools must be ticketed. The girls who do this are paid so much a thousand, and they acquire great quickness in the work. Their hands fly as fast as a skilful pianist in the liveliest music."

In riding about the city, Mr. Burnside called the atten-

tion of the others to the streets newly laid out, to the beautiful residences which have been erected during the last dozen years in the suburbs, and to the new park on Fort Hill. During the different hard times of the last

THE SPOOLING ROOM.

twenty years, Lowell has not once closed her mills, or suffered from a strike.

"How much has she increased in population, Mr. Burnside?"

"Her population now is nearly eighty thousand, or double what it was twenty years ago."

A REVIEW.

1. What four **races** in this land? 2. Desrcibe each race. 3. What kind of a plant is **cotton**? 4. What is a picker? 5. How many times is the cotton doubled on itself? 6. What is a shuttle? 7. Where is the **Spindle City**? 8. Where are the great cotton mills? 9. How is **thread** made? 10. In what cities are thread mills found?

LESSON VI.

A DAY IN BOSTON.

In the early summer Master Albert Lovejoy, who lived in Manchester, New Hampshire, came to visit his cousins in Lake View. Soon after his arrival George and Fred went with him to see some of the sights in the **Metropolis** of New England known as Boston.

They first noticed what George called the "*arteries* of the city;" that is, the main streets, horse, electric, and steam cars. Albert of course compared them with his own city, and noticed that the streets were not so straight, but much longer, flanked by higher buildings, containing wider and deeper stores and finer window-displays, and that the cars were more numerous and larger and more crowded than in New Hampshire.

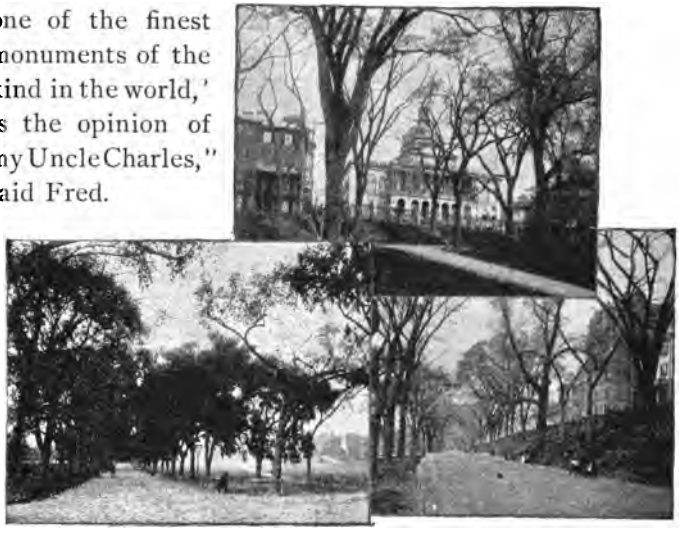
"Are the streets as crowded as this every day, George?" Albert asked.

"Yes; and more so at Christmas."

After admiring several of the great stores on Washington and Tremont Streets, Fred exclaimed, "Let us now look at the '*lungs* of the city.'" They thereupon entered the Common from Boylston Street, and walked along the Charles Street Mall, watching the boys at play on their play-grounds. Then Fred led the way to the Soldiers' Monument, just seen in the right-hand corner of the first

picture. "'This is one of the finest monuments of the kind in the world,' is the opinion of my Uncle Charles," said Fred.

STATE HOUSE.



CHARLES STREET MALL. BEACON STREET MALL.

BOSTON COMMON.

Next the boys went round the little pond on the Common, called the *Frog Pond*, and then up Beacon Street Mall towards the State House, whose gilded dome they saw when coming into the city.

"Dr. Holmes," said George, "once in fun called this building 'the Hub of the Solar System.'"

"Is that why Boston is called by the people in Manchester 'the Hub'?"

"I presume so."

"The State House," said Fred, "stands on the lot which was formerly Governor Hancock's cow pasture, and that block of buildings at our left as we enter, occupies the site of his house."

Crossing Beacon Street and climbing up the stone terraces, the boys first entered Doric Hall, where they spent some time looking at the battle-flags, the cannon used in the Revolution by the Concord Minute-Men, and the statues of Washington and the war governor, — John A. Andrew. George showed them the largest room in the building, the Hall of Representatives, and pointed out the ancient symbol of Massachusetts, the codfish, suspended from the ceiling. This same symbol, George explained, formerly hung in the old State House many years ago. Albert best enjoyed the extensive view from the cupola; his cousins gladly acted as guides, and pointed out the many places of interest.

PUBLIC GARDEN.

COMMONWEALTH AVENUE, BOSTON.

They next visited the Public Garden, situated south of the Common. As the three boys stood on the bridge in the centre of the Garden and looked at the charming view of water, flowers, trees, and plants, Fred asked, "Do you believe me, Albert, when I say this garden

fifty years ago was a marshy flat, overflowed by high tides?"

"Is it possible! Has the city grown much?"

"It covers thirty times as much territory now as was contained in the original area. Its population in 1800 was only twenty-five thousand; in 1890 it was four hundred and fifty thousand."

The equestrian statue of Washington, near which they were standing, delighted Albert beyond expression. It is seen in the picture at the right. From the Garden they naturally walked along Commonwealth Avenue, a much more fashionable street to-day than Beacon Street. This street they found to be two hundred and forty feet wide; in the centre is a strip of park land one hundred feet wide, lined with trees and shrubs. In the picture, page 42, the observer is looking towards the city. They walked through the mall under the trees, as far as the Hotel Vendome, which can be seen in the picture. This great modern palace, containing every luxury imaginable, has a marble front, and cost over a million dollars. It is considered the finest hotel in New England.

They returned to the Public Garden and walked through it on one side, to Park Square, near by.

"What statue is that?" Albert inquired.

"That is called the Emancipation statue. It was made by Thomas Ball, who made the equestrian statue of Washington which you liked so well in the Public Garden. It represents President Lincoln breaking the chains of the slaves."

The boys soon entered and examined the interior of the beautiful Providence Station; as they were looking at the waiting-rooms, eating-rooms, barber shop, and

other rooms, all finished and furnished in the style of our best hotels, George said, "We call the steam railroads 'arteries' as well as the street roads. There are eight important railroad stations in this city, managed by a smaller number of corporations. In these there is an immense amount of business done. Most of these stations are large and commodious. This station-

NATURAL HISTORY MUSEUM AND SCHOOL OF TECHNOLOGY, BOSTON.

PROVIDENCE STATION.

house is one of the finest in the country and the longest in the world. The train house, you see, is about five hundred feet long and spans five tracks."

A substantial dinner was obtained at the Thorndike near by, on Boylston Street, after partaking of which they slowly walked to the Natural History Museum, not far away on the same street. This is the first building to be seen in the picture. Albert was deeply interested in the

collection of minerals, birds, eggs, and skeletons here displayed; but the Cartmell boys had seen it too many times to be as interested, so they walked about as rapidly as possible, and then strolled still farther along Boylston Street, passing several fine buildings, such as the Young Men's Christian Association building on the other side, the Institute of Technology, of which the buildings appear in the picture beyond the Museum, the Brunswick Hotel opposite, and the New (Old) South Church, whose spire can be seen in the distant background in the cut. This beautiful church faces Copley Square, which is surrounded by such remarkable buildings as the new Public Library building, — which will cost several million dollars, — Trinity Church, — the finest and most costly church edifice in New England, — and the Museum of Fine Arts.

At Fred's suggestion they visited the last, and showed Albert enough of the paintings, casts, and ancient collections of art to make him desire to come again.

In an hour they were so tired they were glad to sit on a settee in the picture gallery and rest.

"These museums, schools, and libraries," said Georg "I call the '*Brains* of the city,' the churches I call the '*Soul*,' and the homes for the aged, children, and infirm, I call the '*Heart* of the city.'" Albert now proposed that they should ride during the rest of the day, and George engaged a carriage. The Old South Church on Washington Street and the Old State House near by, at the head of State Street, were briefly inspected.

Passing through State Street, they soon came to Faneuil Hall, which Albert was very anxious to see. He was greatly shocked to learn that the lower part of this his-

torical building was still used as a common market for meat and vegetables.

"Where is the 'Cradle of Liberty'?" Albert asked.

"In the hall above."

After entering this hall from the north end Albert wished to know for what the hall was now used.

FANEUIL HALL.

BUNKER HILL.

"Mostly for political meetings."

"Where do the people sit?"

"They always stand; I have often seen the place crowded solid with men listening to some great speaker."

Albert wished to see one thing more, so they drove to Bunker Hill in Charlestown, and viewed the great granite shaft, and saw the spot where the patriotic hero Warren fell fighting for his beloved country. All felt too tired to climb the two hundred and ninety-five stone steps in the spiral staircase in order to reach the top and see the extensive views.

On their way home Albert declared that this had been a red-letter day in his calendar. He enjoyed the next day, however, almost as much, when the three boys visited the city and rode nearly all day on electric cars to the Highlands to see Franklin Park, to Brookline and Chestnut Hill Reservoir, which supplies the city with water, and to Cambridge to visit Harvard College and Mount Auburn Cemetery.

LESSON VII.

A FLYING TRIP.

"WHO would like to take a quick trip with me tomorrow?" asked Mr. Cartmell one evening, as they all gathered around the blazing logs in the ample fireplace.

"Where are you going, Papa?"

"Business calls me to Worcester, and from there to Providence. I would like some company."

George and Fred volunteered to accompany him. The three travellers started early the following day, and reached Worcester by nine o'clock in the forenoon.

While Mr. Cartmell attended to his business, the boys rode about the town in which George Bancroft, the historian, was born.

They found the city well laid out. The suburbs extend to the summits of the surrounding hills, from which beautiful views are obtained of the amphitheatre below.

On one of the hills near the beautiful depot stands the stone building occupied by one of the State Normal Schools. This building can be seen from the railroad as

At Woonsocket they found how the stream winds about in an excellent way to carry its waters through a good many mills. The entire river-current is drawn under the mill-wheels, leaving the rocks bare below the dam.

George said, "I have read that thirty thousand people here make cotton and woollen cloth."

"The well-known 'Harris Cassimere,'" said his father, "of which our suits are made, was manufactured in this

VIEW OF PAWTUCKET FROM THE BRIDGE.

place. Mr. Harris has an elegant house overlooking the town."

After leaving Woonsocket they passed one manufacturing village after another, each with its great dams and canals. Many of the mills were built of brick, but had no signs to tell owner or business.

"These mills," remarked Mr. Cartmell, "are mostly owned by wealthy corporations in Boston and Providence."

The railway runs among the dams, crossing the river

from one side to the other, cutting through the hills if in its way. In one case it cuts through Study Hill, where the Rev. Mr. Blackstone lived as a hermit among his books, after he retired from Boston to the "wilderness," in 1633.

The boys learned that the river at Pawtucket descends fifty feet, giving enormous power. As it moves on it becomes greater in volume and more dark-colored, dirty, and bad-smelling. This city has a population of twenty-five thousand people. Great brick mills rise in different

CONANT THREAD MILLS, PAWTUCKET, R. I.

parts of the city; in them are made all sorts of textiles, muslins, and calicoes. Here are some of the largest thread-factories in the world. The Coates cotton thread is made in the extensive Conant Thread Mills, which contain one hundred and ninety thousand spinning spindles, and give employment to over two thousand persons.

"Is this place famous for anything else, Papa?"

"Yes, it is noted as the first town where cotton manufacturing began in New England."

"Who commenced the work?"

"Moses Brown and Samuel Slater. The latter served as an apprentice under Sir Richard Arkwright of England. While working for him he stored up in a retentive memory the details of the construction of the cotton machinery then used in England.

"Slater knew the risk of being detected with any model or drawing when leaving his own country, so he came away almost by stealth, without a line which would betray his purpose.

"Slater reached Providence and Pawtucket in December, 1789, and began to make from memory the machines. When first finished they did not work as he expected, and he was down-hearted; but a slight change, suggested by a fellow workman, overcame the difficulty. Slater had reproduced the Arkwright patents for carding and spinning, and thus transplanted to America a most important industry."

"I suppose," said George, "you call Pawtucket, then, the mother of Lowell, Lawrence, Manchester, Fall River, and Lewiston?"

"Yes. But Mr. Slater will be remembered for something else. One Sunday morning as he was going from his house, he heard several boys employed in his mill talking very earnestly. Mr. Slater caught one of their remarks and asked, 'Boys, what are you talking about?'

"'Bill proposes that we go up to Smithfield and rob Mr. Arnold's orchard; but Nat says he does n't think it right to go off Sunday robbing orchards.'

"'No, nor I either,' said Mr. Slater. 'I can tell you something better than that. Go into my house and I will give you as many apples as you want, and I will keep a Sunday-school.'"

CITY HALL AND BROWN UNIVERSITY, PROVIDENCE, RHODE ISLAND.

"This was one of the first Sunday-schools in this country. The lesson-books were five Webster's spelling-books, and the library consisted of three New Testaments."

As Mr. Cartmell and the boys left the place evening had fallen upon the busy river, and ten thousand lights danced in the factory windows, and were reflected from the black waters below.

A few minutes' ride brought them to Providence, the second city in size in New England. They stopped at the Narragansett Hotel.

The next day, while Mr. Cartmell attended to important business, the boys went forth sight-seeing. They first visited the handsome City Hall building near the station. They noticed how clean the streets appeared; that the city is built upon both sides of the Providence River; and that it rises on the sides of various hills, from the summits of which fine views are obtained, and on one of which stands the buildings belonging to Brown University.

Like Worcester, there are many kinds of small manufacturing carried on. Screws, bolts, tools, sewing-machines, stoves, breech-loading rifles, and steam-engines are made there. The Gorham Silver Ware Manufacturing Company is one of the largest of the kind in the world. There are one hundred and fifty jewelry works.

In the afternoon they returned on an express train to Boston, and reached Lake View in the evening. The boys told their sisters about the trip, laying special emphasis on the great amount of *varied manufacturing* which is carried on in this part of New England.

LESSON VIII.

A PAIR OF SHOES.

"PAPA, I need a new pair of shoes," said Fred, one morning at the breakfast table.

"I will get you a pair to-day, in Boston. Do you know, children, how **shoes** are made, nowadays?"

"No," "No," were the replies given.

"Then I must take you to learn the processes. I suppose you know of what they are principally made?"

"Leather," said Fred.

"Yes. We will first visit a tannery and learn how leather is made. I will go to-day with you to the tannery owned by my friend, Mr. Damon."

When the party reached the place they found Mr. Damon in the "beam house," where they saw a good many hides which had been soaked in lime and water for two weeks before.

"This liming answers a double purpose," said he. "It preserves any skin that may have begun to spoil, and it also acts upon the hair, which can now be removed quite easily."

As the party entered the door they saw that opposite each window was a large, round-topped beam fastened slantingly to the floor. A workman took one of the lime-soaked hides, threw it smoothly over the beam, and with a drawing-knife easily scraped off all the hair.

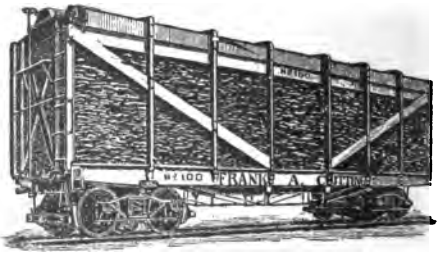
On the opposite side of the room, men with similar tools removed all roughness from the flesh side of the skins. They were then thrown into pits, where for several hours a great wood paddle-wheel tossed them about and washed them free from the lime.

THE BEAM.

At the mouth of one of these pits was a pile of the skins which had just been taken out. In color and texture they resembled tripe, and it did not seem possible that they could ever be made to stand the hard wear that comes upon shoe-leather.

The floor of the beam house was very wet and dirty, and the atmosphere so stifling that after a short time spent there the party gladly escaped to the open air.

On cars close at hand were great piles of hemlock bark, which was to be ground and leached.



HEMLOCK BARK.

In the building where the tan pits were, they were surprised to find the air so filled with steam that they could scarcely see across it, notwithstanding that the sun shone brightly on the windows. They soon saw that a large pipe was discharging a stream of warm water into one of the vats, and asked Mr. Damon what it was for.

"The bark is leached before using just as your mother leaches the coffee for breakfast, and then the liquor is drawn off and the skins lie in it until they are slightly colored. They are then placed in the vats with layers of bark and lie there for about three months. You notice that the floor here appears very loose, and is in oblong sections. Well, each of these sections is the cover to a vat. These smaller vats contain about four hundred skins, the larger twice that number."

TANNERY.

In the next room a machine composed of many little wheels scoured the skins to remove all particles of bark.

They were then placed in great drum-like wheels with a mixture of warm grease in order to make them pliable. After this they were scoured again and scraped, to obtain a good surface for blacking. One workman laid them double on a table and rubbed them vigorously with a curved board strapped to his arm,—"just as if he was trying to iron them and didn't quite know how to do it," said Nellie.

"That is to raise the grain of the leather," said Mr. Damon. "Your pebble-goat boots are made with this grain side out; but when a smooth surface is required the flesh side is finished."

A boy now took the hides and spread a preparation of blacking over them, and a man polished them by means of a heavy piece of glass set in a stout handle. They were then treated with other mixtures and glassed again, trimmed, shaped, and finally, after being handled three hundred times, came out ready to be sent to the factories.

"Where are all the hides brought from?" asked George.

"Most of them are American, but we have them from South America, England, Russia, France, and Germany, and some come to us from India and China."

Mr. Damon told the party that he could not go to Boston with them, but that he should be in Lynn that afternoon, and would see them there.

As they were riding toward Boston, George asked his father if that city did not stand first in the shoe and leather business.

"I think so," said Mr. Cartmell; "and yet if we go through the leather district you will be surprised to find that it comprises only a few streets, and that many wholesale firms do not occupy much more than an office. They have factories at Lynn, Brockton, or some other manufacturing place, and then send salesmen all over the country to sell by samples."

As soon as they had had their lunch they started for Lynn, where they again met Mr. Damon, who conducted them to his factory.

"How many pieces do you suppose there are in a pair of boots like those Florence wears?" asked he.

"Twenty-four," ventured George.

"Thirty," said Fred.

"I never thought of it before," said Mr. Cartmell. "How many are there?"

"Over forty, not taking into account the buttons, nails, or thread. Let us watch this workman a few moments as he is cutting out, and notice the number and uses of the pieces."

The man to whom he referred stood at a table on which was spread a skin. He glanced it over quickly, arranged his patterns on it, and with his sharp knife cut out the pieces needed for the uppers of the boot. Then a lining was cut from drilling, and stays were made from sheep-skin for the top, heel, and buttons.

These pieces were carried to the stitching-room, where there were long rows of sewing-machines run by steam, but guided and fed by girls. The outside and lining were made separately and sewed together on the wrong side, then turned carefully and stitched round.

It now began to look quite like a boot, and all watched with interest while a machine cut and worked a button-hole in each button-scallop.

BUTTON-SEWING MACHINE.

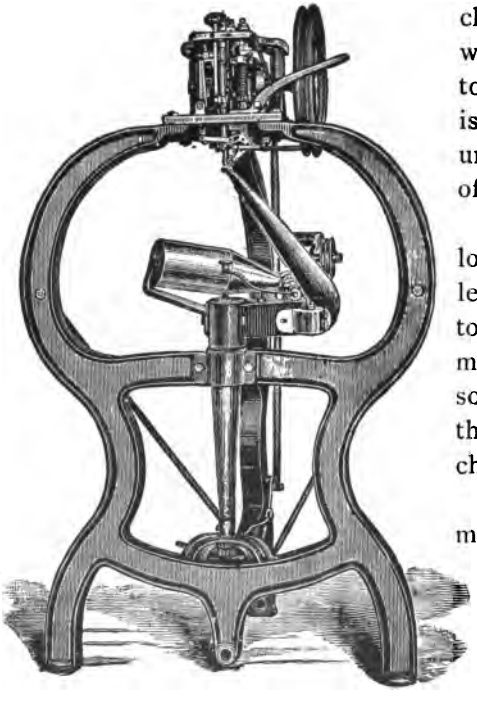
"Oh, dear! how quickly and nicely it does that," said Florence, who very much disliked to make button-holes. "I wish we had one of those machines at home."

Her father laughed, and told her that while it was adapted to making very nice button-holes in her boots, it would not be likely to do nearly as good work on her dresses.

"Here is another machine which sews on the buttons," said Mr. Damon. "Now the upper is done, and ready for the sole; we will watch the manufacture of the latter. The sole leather is first dampened, then run between two

rollers to be shaved free of all inequalities. The soles are then cut out by means of dies, which work very rapidly."

Mr. Damon took up one of these soles and asked them to examine it. "Before the sole is sewed on to the upper a channelling machine makes a groove where the stitching is to be done; but here is something which unites the operations of that and of the die."



MCKAY SEWING MACHINE.

They turned to look, and saw that the leather was fastened to a form; then by means of knives the sole was cut and at the same time the channel made.

"What is this next machine doing?" asked Fred. "It looks as if it shaved down the sole to make it thinner."

"No; look a little more closely and you will see that it does not touch the middle where the greatest strain comes, but does take from the edges. The object is to combine the greatest strength with the least weight."

The soles were now pressed between heavy weights in order to give the arch needed at the hollow of the foot, and then it was ready to be joined to the upper. This required great skill, as the upper must be fitted very nicely over the last, pulled tightly in one place and stretched a little in another.

The children's father told them that the McKay machine, which now stitched the sole and upper together, had made more changes in the shoe business than any other invention. This machine can sew six hundred pairs of shoes in a day, while the old-fashioned workman could do barely three dozen.

PEGGING—MACHINE.

In another room they saw the soles and uppers fastened together by pegs driven by a pegging-machine at the rate of nine hundred a minute.

"How many shoes can a man peg with this machine in a day?" Mrs. Cartmell inquired.

"About five hundred, madam."

Next they watched how the heels were made by several different machines, each one doing some small part, — as, one machine cut the lifts; another nailed them to the sole; another shaped the heel; another burnished it. When a white kid lining was pasted over the inner sole, the boot was pronounced finished.

Mr. Damon then led them into the packing-room, which seemed very quiet after the whir of the machinery. Here girls buttoned the boots and laid each pair by itself in a pasteboard box ready for the retail dealer to sell.

Our friends thanked Mr. Damon heartily for his kindness, and then took the cars for home, delighted with all they had seen and learned during the day.

LESSON IX.

OFF TO THE GREEN MOUNTAINS.

Mr. and Mrs. Cartmell and the two girls were comfortably seated in a drawing-room car on the Fitchburg railroad, when Nellie asked her father, "Do we go through a mountain on this trip?"

"Yes, Nellie, but you need have no fear. Look out of the window and see this beautiful river and narrow valley. We are now rapidly ascending the Deerfield valley to the Berkshire Hills, in the western part of Massachusetts. What mountainous scenery about us, — deep valleys, lofty precipices, dangerous cliffs! Here a sad accident once occurred when the banking gave way and a train of cars was thrown into the river."

In a short time it was dark at the windows, the lamps were lighted by the porter, and all the windows and ventilators were closed to keep out the smoke; the train was running through the Hoosac Tunnel.

BENNINGTON MONUMENT.

Mr. Cartmell looked at his watch and found they were about twelve minutes in the mountain, going four and one half miles.

A short stop was made at North Adams, from which place excellent views are obtained of Greylock and Saddle Mountain away to the south. By changing cars at the next junction, Bennington in **Vermont** was soon reached.

After dinner they took a ride in a carryall.

"Where are you going, Papa?" Nellie inquired.

"To see the town, and its history."

"How can you *see* its history?" asked Florence.

"Well, we will see its historical places, and that will help us remember its history."

In the ride they passed through many fine streets lined with stores, or handsome residences, and saw scattered about on the plain several mills, in which woollen garments are knitted, wood-pulp mills, and at one side the pleasantly situated State Soldiers' Home. The road leading to the centre of the town soon begins to ascend, and the horses were allowed to walk.

"What tall monument is that?" both girls asked at once, as they approached the crest of the hill.

"That is the Bennington Battle Monument, which has been erected to celebrate the great victory gained by the colonies over the detachment sent out by Burgoyne under Baum to capture the military stores in this town."

Examining the monument carefully, they learned that it was built of gray-blue dolomite, a kind of marble, and that it was three hundred feet high.

"It is eighty feet higher than the Bunker Hill monument," said Mrs. Cartmell, "and also differs from it in

having its sides slightly curved. What a fine view one must have from those windows! Does this monument stand on the battlefield?"

BENNINGTON BATTLEFIELD.

"No," replied Mr. Cartmell. "It stands very near the spot where the military stores were kept which Baum was so anxious to obtain. The battle-field is four miles to the west."

"Please drive us there."

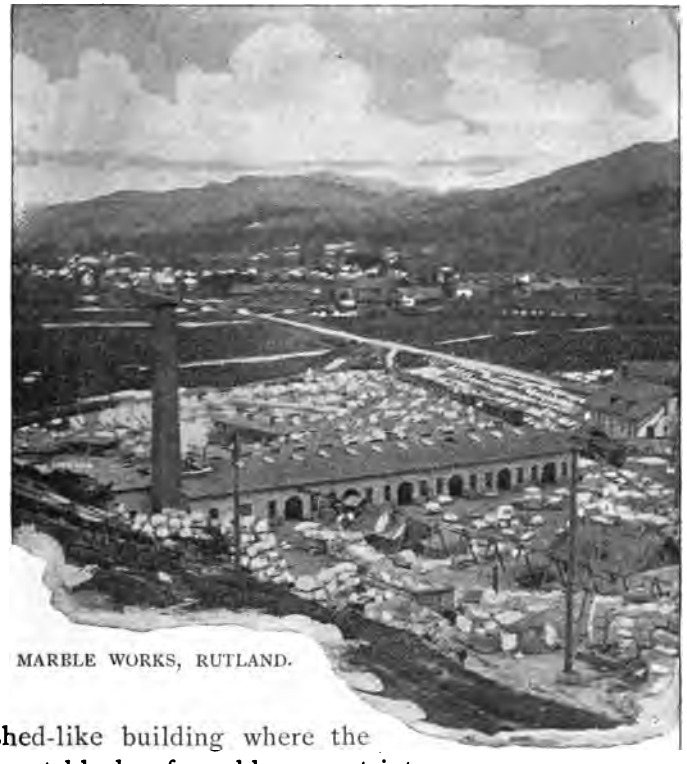
As they rode along through the country roads, it was apparent that Bennington lies in a beautiful valley, surrounded by a grand amphitheatre of hills, the beginnings of the Green Mountains stretching far away to the north.

Rutland was the next place of importance visited on this trip. At West Rutland they saw the celebrated **marble quarries**, which are not in the side of a high hill, but where the ground is quite level.

MARBLE QUARRY, RUTLAND.

The excavations, they learned, are now about one hundred feet deep, with quite vertical sides. The marble is usually taken out in the form of great oblong blocks from ten to fifteen feet long and from three to five feet wide. Drilling is done by machinery. A machine, which Nellie thought looked like a locomotive, and which moved back and forth on a temporary track, cut into the marble on each side by means of chisels that are lifted and allowed to fall like a trip-hammer. The block is torn from its ancient bed by the help of wedges.

The children were next taken by their parents to a



MARBLE WORKS, RUTLAND.

shed-like building where the great blocks of marble are cut into slabs by gangs of saws which move rapidly back and forth. The cutting is mainly done by wet sand fed into the opening made by the saws. These saws and the sand cut at the rate of two and a half inches in an hour. Sand and water are also used in polishing.

"Most of the Vermont marble," said Mr. Cartmell, "is like this, white with dark bands. It is used for building purposes and for monuments. A red variety is quarried in the northern part of the State."

"What State produces the most marble?"

"Vermont."

"Does it produce other minerals?"

"Yes. Vermont stands next to Pennsylvania in producing slates, and it is becoming a rival of New Hampshire, the Granite State, in turning out granite."

"Where are these minerals found?"

"**Slate** abounds in this same county, a few miles to the west, in Poultney and Castleton. In the latter place are made most of the slate pencils used in this country. A soft slate is used for pencils. The slate has to be split

CITY OF BURLINGTON, VERMONT.

into thin layers as soon as it is taken from the quarry. When it becomes dry it is not easily separated. If the slate is to be used for school purposes, it is smoothed with sand.

"Granite is quarried at Dummerston in the southern part of the State, and in Barre, near Montpelier, in the northern part. In the latter town the business has increased and the town is rapidly growing in population, so that three railroads now run into the place to accommodate the transportation."

The Cartmell family the next day journeyed to Burlington by way of Lake Champlain. A most enjoyable trip rewarded them for a tedious delay at Fort Ticonderoga, at the head of Lake Champlain. The steamers on this lake are large, well-managed vessels, that make good time, reaching Burlington in about four hours.

Mrs. Cartmell became unusually enthusiastic over the beauties of Vermont's chief commercial city. It is built on a slope gradually rising from the lake. Fine large shade-trees line the clean, well-paved streets, and partly conceal the trim lawns and handsome houses. On the height of land stand the buildings of the Vermont University, from whose belfry a splendid panorama can be seen of the town, lake, and Adirondack Mountains in New York.

After a good night's rest, Mrs. Cartmell and Florence crossed the lake to Port Kent, and rode on the new railroad to Au Sable Chasm, described in the "Second Reader." Mr. Cartmell and Nellie, meanwhile, took a side trip to St. Albans, to visit one of the great **butter factories** of the present day. The Franklin County Creamery Association, Mr. Cartmell found, is making seventy-five hundred pounds of butter a day, and yet it does not own much live stock. The milk from six hundred dairies is carried to various centrally located buildings called "separators." Here the cream is *separated* from the milk by centrifugal, or revolving, force, and the creamless milk is immediately given back to the farmer to carry home for his pigs and calves. The cream thus obtained is sent to St. Albans to be made into creamery butter by the most recent and improved processes.

When the travellers returned to the Van Ness House in Burlington, each one had a long report to make in regard to the incidents of the trip and the pleasures of travel. The girls thought the resources of the neighborhood must be nearly exhausted, and proposed to return home before the charm was broken. Mr. Cartmell replied to this proposition that he had heard of other lovely scenes, and proposed to advance the following day —

> "By maple orchards, belts of pine,
> And larches climbing darkly
> The mountain slopes, and, over all,
> The great peaks rising starkly."

"Notice me, Nellie, as I draw this rectangle four inches by two. I divide it by a sloping crooked line into two parts of about the same size; what States do the parts resemble?"

"Vermont and New Hampshire."

"As I indicate the largest towns in each State, you will notice that Vermont has her large towns in the northern part and New Hampshire in the southern part. The reason of this is because the best land, the longest rivers, and most valuable resources, such as mineral deposits, are thus distributed.

"The rivers of this part of the Green Mountain State flow west and north into Lake Champlain; those of the White Mountain State flow east and south into the Atlantic. We propose to cross from one drainage to the other. Shall we go down and then up, or up and then down?"

At first the girls could not answer his question; but after their father drew a few lines on the paper indicat-

ing the direction of the rivers he had spoken about, Florence replied, —

"We must go up first and then down."

"What do you call the line dividing the two slopes?"

"The water-parting."

"In this state it is often called the Ridge."

East of Burlington rises

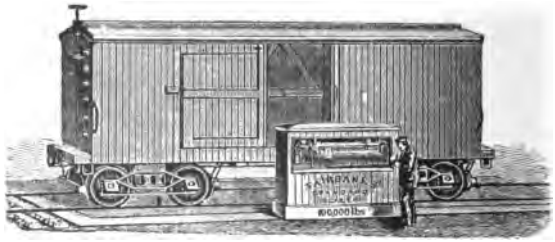
FAIRBANKS SCALES MANUFACTORY.

the highest point of land in the State, known as Mansfield Mountain. Mr. Cartmell and his family rode in the cars round the peak towards the north, going up the beautiful Lamoille River valley, through a rich farming country to the eastern ridge, and descending by many sharp turns to the Passumpsic River, a branch of the Connecticut.

This trip brought them to the largest town in the northwestern part of the State, — St. Johnsbury. Here they remained for three days, enjoying the varied mountain

and valley scenery, and the many glimpses gleaned from lofty heights of the White Mountains away to the east.

On the second day a visit was made with Mr. Merrill to the great twelve-acre factory, where are manufactured the well-known **Fairbanks' Scales**. They were first conducted to the foundery building, in which they saw the melted iron flow like liquid fire from the great furnace. Showers of sparks filled the air and covered the men, who caught the iron in ladles and carried it to the moulds in



RAILROAD SCALES.

different parts of the room. The men poured the iron into the moulds. When these were opened in a few moments, scale beam, weight, or lever was found, according to the shape of the cavity in the sand mould. The castings have to be cleaned and trimmed before they are used. The brass parts of the scales are cast in a smaller room, but in a similar way.

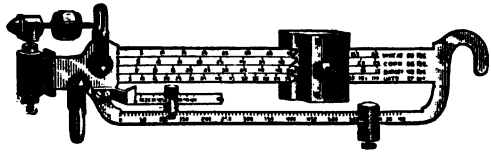
"How do you mix your alloy to make brass, Mr. Superintendent?" Mr. Cartmell asked.

"We use about two parts of copper to one of zinc."

Another large and unique room was the great blacksmith shop, where more than fifty forges and anvils were alive with work. Air is supplied to each forge by water-

power instead of by hand. Bolts, iron rods, links, and pivots are made here by the thousand.

In another room the different parts of the scale are put together. In the next room some of the scales are tested to make sure of their accuracy. This requires great skill and patience. The hay and car scales are set up, and two



GRAIN SCALES.

men try them with heavy iron blocks which are moved on and off the scale by stout cranes. Accuracy and perfection of work are constantly required. In a smaller room twenty or more men were testing grocers' scales and grain scales. The latter weigh and reduce to bushels.

"Mr. Guide, how many men are employed in the different departments?"

"Six hundred or more."

"How many scales do you make in a day?"

"We turn out on the average twelve hundred scales each day."

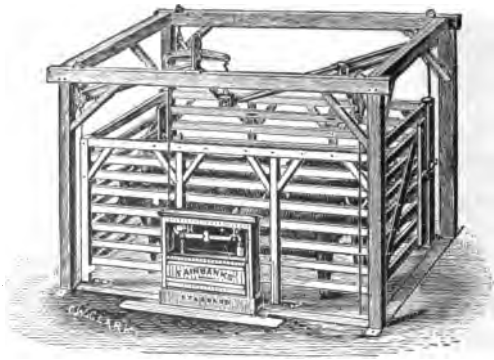
"Why, what do you do with them all?"

"They are sent to every country in the world. Look into this room, and see the number of men needed to make the boxes in which to send away the scales. Most of the lumber you saw in the great lumber yard is used for these boxes."

"You make here, I suppose, many different kinds of scales, do you not?" Mrs. Cartmell asked.

"Yes, madam. We make over one hundred varieties, and so many sizes that every year we sell more than a thousand different-priced scales. These vary in size from a little three-dollar scale for weighing a letter, up to a scale for weighing an ox, or a car scale to weigh three hundred thousand pounds, and costing four thousand dollars."

On their way home Mr. Merrill told how this one industry had built up St. Johnsbury, and made it a remark-



LIVE-STOCK SCALES.

able town. "The Fairbankses have always treated their workmen with kindness and paid them liberally. They never had a strike or any trouble with their men. The money made in the business is shared with the townspeople for special improvements. Hence this small town has a splendid Academy, the buildings for which were given by a member of the Scale Company; it has a large Young Men's Christian Association building given by another member. The brown stone building on Main Street, opposite the handsome North Church, is the

Scientific Museum, given by the president of the company. Governor Fairbanks, before his death, gave the Athenæum, which contains a fine library free to all, a large art gallery, in which hangs Bierstadt's masterpiece, — 'The Domes of the Yosemite,' — and a handsome hall to be used for free entertainments."

"What a pity," said Mr. Cartmell, "that rich men in other places do not thus use their wealth, and help to make the people contented and happy."

"This is a good town to live in. We have good stores, schools, churches, gas, electricity, pure water, good drainage, and not a liquor saloon."

On the following day Mr. Cartmell called upon his friend Professor Brackett, teacher in the St. Johnsbury Academy, who took his visitors to the top of the Academy building, from which place they obtained a fine and extensive view of the village, valleys, and surrounding hills. He pointed out to the west a celebrated maple-sugar orchard.

"Last winter at that place I took several photographs of the modern methods of making **maple sugar.**"

"Please show them to us," said Nellie, "for I like maple sugar so much I wish to learn how it is made."

"I will do so with pleasure," replied Professor Brackett, "when we go down."

After seeing the pictures, Mr. Cartmell invited Professor Brackett to join his family, and drive out to the orchard.

After reaching the side-hill, where the trees grew quite near one another, and in summer were abundantly covered with foliage, Mr. Cartmell asked the professor to explain the modern process of making sugar.

"Early in the spring, in February or in March," Professor Brackett said, "the trees are *tapped.* This is the time of the year when the sap begins to ascend."

"What do you mean by 'tapped'?" inquired Florence.

"Look at this tree and see the hole bored in the trunk last spring.

SAP-HOUSE.

GATHERING THE SAP.

Into this hole is driven this tube, or spout, about six inches long, upon which is hung a pail to catch the sap as it trickles out. This is collected two or three times a day, and carried on the ox-sled to the sap-house. Here it runs into a large reservoir, and from that into a long, shallow iron pan, where the process of *boiling down* begins. This is finished in smaller and deeper kettles. When the sirup is thick enough it is poured into moulds in which it *granulates,* — that is, turns to sugar.

"Did you ever eat the sugar cooled on snow, Florence?"

BOILING DOWN.

"No, I never heard of such a thing."

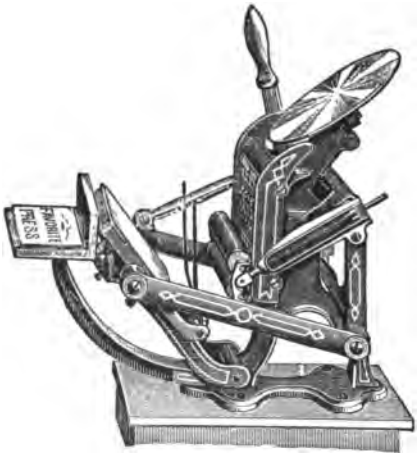
"It is a common practice at 'sugar parties' here in Vermont. The flavor is greatly improved by this simple process."

ST. JOHNSBURY.

"Upon a village green,
The flowing hills atween,
Which ancient trees with grateful shadows fill,
A rare and rambling town,
Of wide renown
And fairest fame, —
St. Johnsbury its name, —
Sits queen,
Whose ample villas crown
The graceful curvature of many a hill."

LESSON X.

TYPES AND PAPER.



AMATEUR PRESS.

MR. CARTMELL and the girls strolled one rainy day into Fred's play-room, where they found him busy with his amateur press.

"How does your press work, Fred?" Florence asked.

"I can use it now very successfully."

"We have come up to see you work, Fred," said Nellie.

"Can you show the girls how you *set type?*" asked Mr. Cartmell.

"Yes, Papa, if you will give me something to set up.

Mr. Cartmell then wrote the following paragraphs about —

PRACTICAL PRINTING.

"Printing is the art or practice of impressing letters, characters, figures, or pictures on paper or other substances.

"There are two distinctive kinds of printing. One kind is called *letter-press* printing, and is done directly from the type itself. This was the original kind of printing, and for a long time was the only kind in general use; it

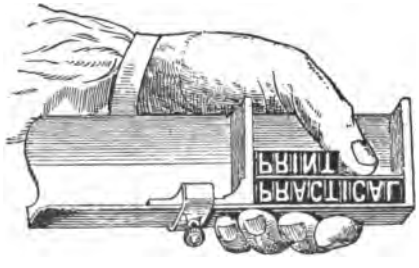
is still the prevailing process in all small book, job, and newspaper offices. The other kind may be called *plate*-printing, or printing from "plates" made by the stereotype and electrotype processes. This latter kind of printing is a comparatively modern invention, not only to save the type itself from needless wear, but to cheapen the cost of books running through many or large editions.

"The kinds of printing-press in use are many and various,— from the original simple hand-press, to the large and complicated cylinder-press propelled by steam. On the hand-press a good pressman could "work-off" about *two hundred and fifty* impressions in an hour; on the cylinder-press *twenty thousand* and even many more impressions an hour are sometimes made.

"The letters, marks, and signs with which letter-press printing is done are called *types*. A complete assortment of types is called a *font*. A font generally consists of the following:—

LETTERS, FIGURES, PUNCTUATION AND OTHER SIGNS,
DIPHTHONGS, SPACES, QUADS, BRACKETS."

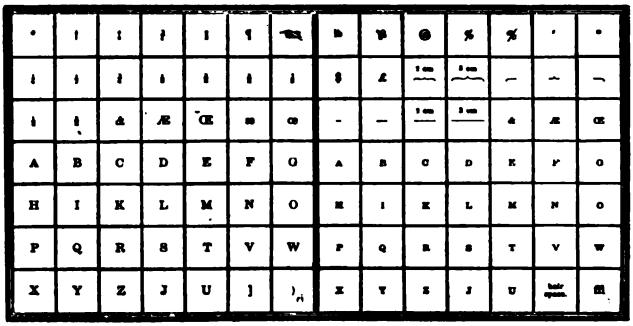
Fred stepped to his compositor's case and took up his composing-stick, which he held in his left hand in the manner indicated here.



COMPOSITOR'S STICK.

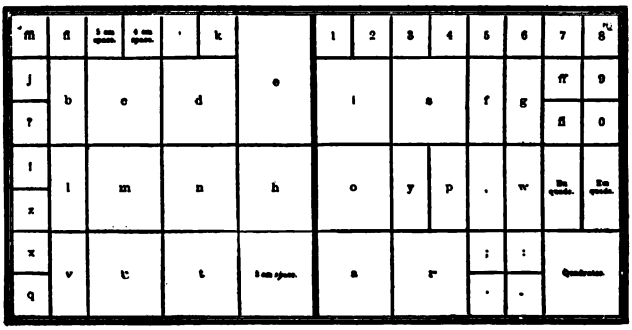
The case at the top contained capitals principally, and Fred called it the "Upper case." The boxes were of about the

same size. The letters, signs, and spaces were arranged as follows: —



UPPER CASE.

The case below has the boxes of different sizes because some letters are much more frequently used in words than other letters. These large boxes are filled with the more frequently used letters, such as e, d, i, a, t, etc. This case is for the small letters. It is placed nearer the person setting the type, and Fred called it the "Lower case." The letters were thus arranged: —



LOWER CASE.

"First," said Fred, "I take out of this box the first letter in the title, which is capital P, and I place it in my stick with the nick uppermost."

"What is the *nick?*" Nellie asked.

ONE TYPE.

"It is this little hollow place cut out near the end opposite that where the letter is, so that I can tell by feeling which side to place uppermost to bring the type into the right position."

"What do you do next?"

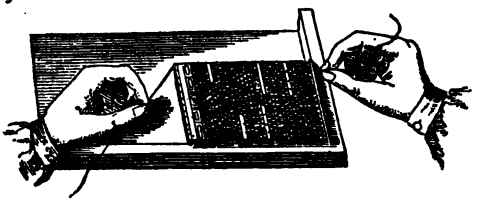
"I pick up the next letter from the box and place that next to the first, and so on, making my fingers move as quickly as possible."

Fred soon had the two words forming the heading set. Then he placed quads on each side to fill out the line, making it look in the stick like this:—

PRACTICAL PRINTING.

After this had been done he set the body of the paragraph, using capitals only where needed. When the stick was full, he lifted the type out and placed it on the *galley.*

Again the composing-stick was filled, and the type placed on the galley. This was done a few times, until all the *matter* was set up.

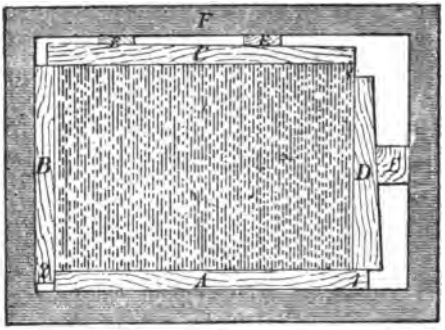


TYING THE TYPE IN THE GALLEY.

Then Fred tied up the type with a string to keep it from falling apart.

After he had done this, he carried the galley to a table

and pushed the type from the galley upon the top of the table. He then put around it a *chase*, or iron frame, and *locked* the matter up by means of wooden side-sticks and *quoins*, as shown in the next cut.



FORM ENCLOSED IN CHASE.

"Do you have different kinds of type?" Florence asked.

"Yes, I have several kinds."

"What are the names of the different kinds?"

"I can answer that question best by showing you a few specimens of type on this card."

SPECIMENS OF TYPE.

PICA . . .	Instructions in improvements in
LONG PRIMER .	Instructions in improvements in the art o
BREVIER.	Instructions in improvements in the art of Prac
NONPAREIL	Instructions in improvements in the art of Practical Printi
PEARL	Instructions in improvements in the art of Practical Printing.

"Now, Fred," said his father, "you have explained so well the way you print a letter-heading, circular, or short paragraphs, that I will take you to-morrow to see the University Press."

"Where is that located?"

"It is in Cambridge, near Harvard Square. But before we go I will tell you something about the paper upon

which a book or magazine is printed. Do any of you know who the first paper-makers were?"

No one could tell.

"The wasps," continued their father, "are the earliest paper-makers. You have all seen their nests. Cousin Charles has one over a foot in diameter which he brought from Brazil. The Egyptians were probably the first people to make paper. They made it from the papyrus; hence our word 'paper.' For many centuries it was made in Europe from cotton, and the best quality from linen rags.

"Water-marks were generally made in the paper. Sometimes it was a crown, a coronet, a hat, or the 'fool's cap and bells.' The last device is never seen now in the water-marks; but the name remains for a certain shaped sheet, which is a little longer than letter paper, and very much larger than note-paper."

"Why do they make paper of rags, Papa?"

"Because rags, after they are cleaned, make just as good paper as new cloth, and are much cheaper. There are a good many steps in paper-making. The rags are sorted, the hooks, eyes, pins, and buttons removed, and then they are cut into small pieces. After this is done the rags are boiled in water containing caustic soda. After more cleaning, the rags are reduced to 'half-stuff.' This is carefully drained and dried and then bleached. The material is next beaten and refined, and then it is called *pulp*. The desired color is given to it in this state.

"In the large paper-making machine the pulp is placed at one end, where it is poured out upon wire-cloth and drained, and then pressed a little between rollers. The

web then passes over drying cylinders and various rollers, each of which removes some of the moisture, or presses the paper to make it smooth. It comes out of the other end of the machine in the form of a large roll of paper. In this form the paper is used for daily newspapers. In later years a great deal of the paper used has been made from a mixture of wood pulp and rag stock.

"If the paper is intended for writing-paper it must next be 'sized,' — that is, covered with hot glue containing a little alum, — dried again, and pressed with great force to make it smooth. The blue lines are next made by running the paper over threads kept moistened with blue coloring. Then the paper is cut up by machines into the desired sizes."

"Where is writing-paper made?"

"Principally in four States; namely, New York, Massachusetts, Connecticut, and Pennsylvania."

"Are newspapers printed on the same kind of paper as that used in books?" Fred asked.

"No. Most newspapers are now printed on paper made of wood."

"Paper used for wrapping is made of what?"

"Principally of straw."

LANGUAGE LESSON.

Write a short composition on PRINTING, using the following sub-divisions: 1. Amateur Press. 2. Composition. 3. Types. 4. Galley. 5. Chase. 6. Making Paper.

LESSON XI.

HOW BOOKS ARE MADE.

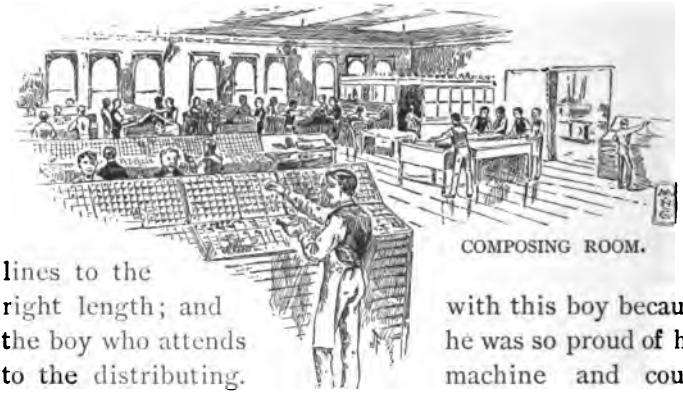
THE next morning, after breakfast, Fred and his father started for Cambridge, where the first *printing-press* in this country was set up in 1639.

The steam and electric cars carried them in a few hours to the great **printing establishment** owned by John Wilson and Son, where this book was printed. The printing establishment is called the "University Press." They were most cordially received, and were fortunate in having as escort and guide young Mr. Wilson, son and grandson of the men who have made this firm known all over the country.

Mr. Wilson first took them up several flights of stairs into the composing-rooms.

Here Fred saw, not one person setting type slowly, as he did at home, but scores of them working with great speed and accuracy, and setting it three times as fast as he could. But Fred was especially interested in watching the Thorne Type-Setting Machines, made in Hartford, Connecticut, composing with a speed much greater than that of any compositor he had seen. These machines are worked in a manner similar to that of a type-writer, by pressing a key with the finger, which brings down the required letter from a vertical groove on the side of the machine. There are ninety of these grooves for the letters, figures, marks of punctuation, etc., needed in printed matter, and the same number of keys.

The upper part of the machine distributes type as rapidly as the lower part sets it; and both of these processes are carried on at the same time. Three persons are required to run it,— the compositor, who fingers the keyboard; the "justifier," that is, the one who spaces the



COMPOSING ROOM.

lines to the right length; and the boy who attends to the distributing. Fred was delighted with this boy because he was so proud of his machine and could explain it so fully.

FRED.— "What are you doing there?"

BOY.— "Putting in a line of type."

FRED. — "What makes the e's always fall into the right groove?"

BOY. — "Because each type has the nicks different, and each groove has little projections on the side to correspond to the nicks in certain letters. If the type has three nicks it will only fall into a groove having three projections to fit the same number of nicks."

FRED.— "Then common type would not answer for this machine?"

BOY. — "Not till it had been cut and shaped like these."

FRED.— "Does n't the type stick sometimes?"

Boy.—"Not enough to do any harm."

"Mr. Wilson," inquired Mr. Cartmell, "how does the amount of work done by the machine compare with that done by hand?"

"A good compositor can set in book-work about five thousand ems in a day. One machine handled by two girls and a boy can set thirty-six thousand ems in the same time. As the distribution is without mistakes, there are fewer mistakes in the composition, and so the proof-reading is more quickly done. The Thorne machine may be considered a success."

"Do you set up books in any other language than English?"

"Oh, yes. Here are the sheets of a Russian book we are now bringing out. We print a good many in Greek, some in French, in Hebrew, in German, etc. We frequently print music-books, and sometimes an order comes for a text-book in some Asiatic language spoken where the missionaries are working, as in Burmah or Turkey."

Before leaving the composition-room, Mr. Wilson showed them how the first proof is obtained, called the "galley-proof," taken before the pages are made up. Most of the corrections are made on the galley-proof. After these changes are made, the type-matter is arranged in pages, and the cuts for the pictures are put in their proper places,—when possible, in the centre of the page. Page-proof is "pulled," as the printers call it, on a *Washington* press, which is nothing more nor less than an old Franklin press of over one hundred years ago.

Fred printed his paragraph directly from the type. In the same manner small editions of books, newspapers, and circulars are printed from the type; but the type

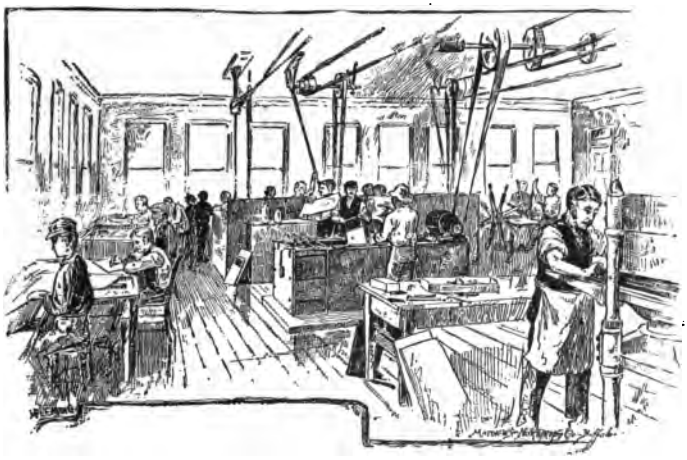
WASHINGTON PRESS.

becomes quickly worn out in this way, and soon fails to make clear and perfect letters. All large editions of books and newspapers are made from "plates."

"Most of our books are printed from electrotypes," said Mr. Wilson, "so we will go to that room next."

The party were conducted to a small room on the ground floor, which from the necessity of the case was not as clean as an ordinary parlor. The furnaces, the melting wax and lead, the dust from the atoms of black-lead floating in the air, prevent a very high order of neatness.

"Please step this way, Mr. Cartmell," said their guide. "Notice this pan of beeswax about a fourth of an inch thick. The workman, you see, sprinkles it over with black-lead, then places upon it the chase of type, and presses the type into the wax in this moulding-press.



ELECTROTYPING AND FINISHING ROOM.

Look at the wax tablet as it comes out of the press, Fred. Can you read it?"

"Yes, easily; it looks like printed matter."

"More black-lead is sprinkled over the wax plate because it will conduct electricity. The wax plate is then submerged in a vat of dark fluid, and left there for a few hours. You see this vat in the centre of the room, with two workmen near it, who are "dipping" the plates. The buzzing little dynamo at the end of the tank, turned rapidly by the belt, sends a current of electricity through

the vat which deposits a thin layer of copper on the wax mould, and reproduces the type and cuts.

"This bright copper 'shell' is about as thick as a sheet of common paper. It is too thin to be printed on, and has to be 'backed up' and mounted."

Mr. Wilson led them to the opposite side of the room, where they saw the workmen pour from ladles the right amount of melted metal into the shell to make a plate about one fifth of an inch thick.

"Notice how bright the metal is when it is poured."

"Is it melted lead?"

"It is composed of lead, tin, and antimony, mixed in certain proportions."

The party then went into the "finishing-room," upstairs, where the plate is planed down to a thickness of one seventh of an inch, squared and trimmed, and all unnecessary metal cut away. The finishers before the windows inspect and correct each plate. Then a proof is taken and compared with the type-proof. Mr. Wilson showed them how mistakes are corrected and slight changes are made in these plates by cutting out words or lines and soldering in the new parts. He gave Mr. Cartmell and Fred a part of an electrotype shell, and shavings of the metal cut by the planing-machine from the back of the plates. They thanked him for these souvenirs of the visit.

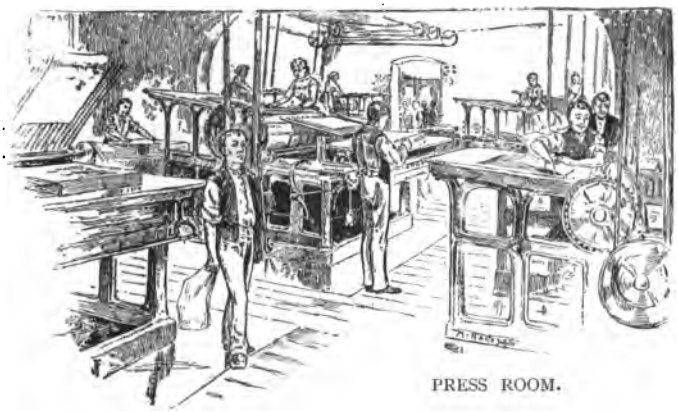
Fred asked Mr. Wilson what value these plates had over types.

"When the types are printed from directly, they become badly worn after a few thousand impressions have been made from them; but the electrotype plates can give a hundred thousand impressions, or more, without loss of

beauty or sharpness. They can be handled more easily, as they are so much lighter. They can be kept for future use, packed away in small boxes like these."

"Are not plates made by the stereotype process?" Fred inquired.

"Yes," said his father. "In this method the printed matter or form is placed under a press and a matrix made



PRESS ROOM.

of dampened paper is placed over it. When the pressure is applied the type is forced into the damp paper. After this becomes dry the molten metal is poured over it."

"When is this process used?"

"When there is little time allowed to make the plate, as in printing large editions of daily newspapers; but the results are not so good as by the electrotype process."

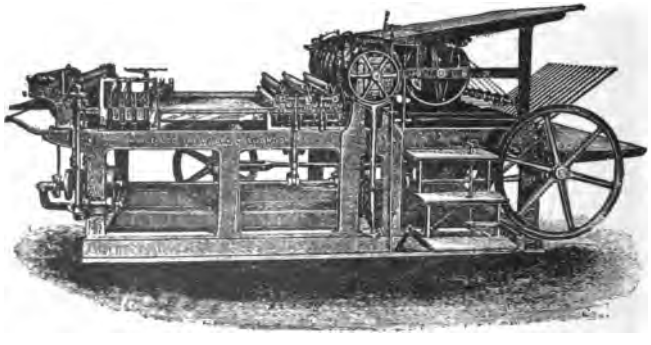
The visitors were conducted next to the press-rooms, of which in this great establishment there are several. Each room was filled with presses of different kinds, each press having its special work to perform. In most of the rooms the presses were tended by women, who

are called "feeders;" that is, they "feed" the press by placing a large sheet of paper in position, whence it is drawn down by the machine, and passes to the place where it receives the impression of the type.

In one large room all the presses were the Adams press, invented years ago by a Boston man.

"For what do you use the Adams press?"

"For small-sized orders. They do very good work, but they run slowly, throwing off only one thousand impressions in an hour. We shall never buy any more."



FAST PRINTING BOOK-PRESS.

In another room they saw only cylinder presses. The one on which this book was printed is shown above. It was made by R. Hoe & Co., New York and London.

In this press the plates are placed upon a bed which moves to the right and left under the large cylinders in the centre of the machine. As the plates move to the left they are inked by the many little ink-rollers above them. The attendant, who stands on a little platform, slips a sheet of paper from a large pile of unprinted sheets on to the inclined table; the paper is there caught by

iron fingers and drawn under the great cylinder just as the plates come back, and the impression is quickly made, and then the sheet is passed out upon the table at the end of the press. Only one side of the sheet is usually printed at a time in book-printing.

"Is the book bound as soon as the sheets are printed?"

"Oh, no. The sheets are dampened before printing, because they receive much better the impression from the plates. They are, therefore, carried to the drying-room, where they are hung up in bunches over poles to dry for a day or two. After this they are badly wrinkled, and so they are subjected to great pressure in hydraulic presses."

"How much pressure is put upon them, Mr. Wilson?"

"Two hundred tons. The paper remains in the press six hours or more, and then it is ready for the binder."

On their way home Mr. Cartmell told Fred about a visit he made a few weeks before to a bindery. "I noticed," said he, "that the sheets of paper are first folded in a machine which does the work faster and better than four girls can do it by hand, folding twelve thousand sheets in a day of ten hours.

"The sheets are usually printed in four, eight, sixteen, or thirty-two pages, and these machines fold according to the number of pages.[1] The first set of pages, called a 'signature,' is marked A, or 1; the next set, from page 16 to page 32, is marked B, or 2; and so on. This is done for the convenience of the binder, who gathers up the different signatures to sew them together to make the book.

[1] In this book the sheet is folded four times into sixteen pages, and is called a 16mo.

"The sewing with thread or wire is done by machinery, the thread passing through each signature of an ordinary sized book five times. Then the edges are cut, the back is glued, and paper linings fastened on with which to bind the book to the cover."

"How are the covers made?"

"The covers are made in another department of the bindery. The letters and designs are engraved on a metal stamp, and the impression is made in an embossing press either in colored ink or in gold-leaf."

"We have books in our house bound in many different styles. I like best the way the set of 'Waverley Novels' is bound," said Fred.

"Well you may; they are bound in half morocco. So are the encyclopædias. The gazetteer and a few other of my books are bound in calf. Most books are cloth bound. The best bound book in the house is the Oxford Bible I gave you last Christmas."

"I remember you told me that the leaves are sewed with silk by hand; and the cover I know is full morocco with projecting edges. It will lie open anywhere."

BOOKS.

My maxims are — never to begin a book without finishing it; never to consider it finished without knowing it; and to study with a whole mind.

BUXTON.

LESSON XII.

TWO WEEKS ON THE MAINE LAKES.

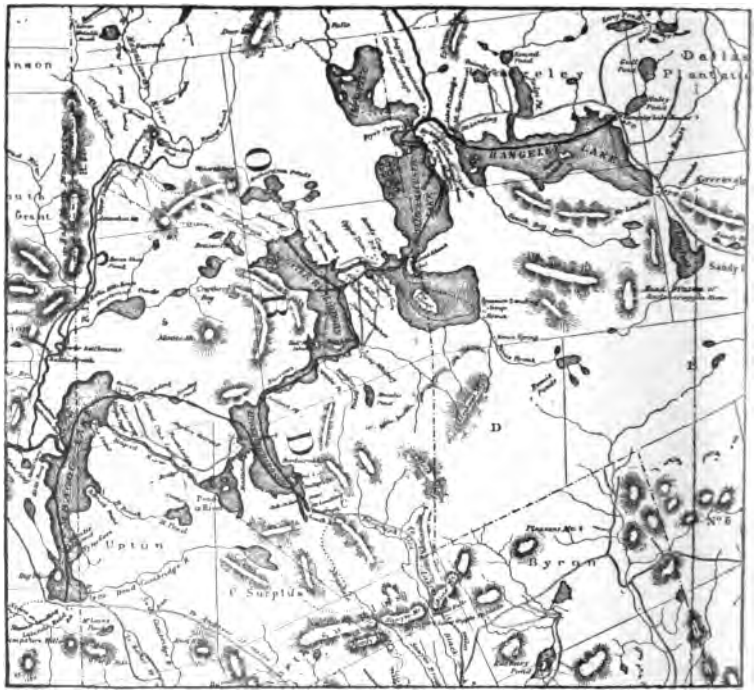
ONE evening, during the summer, Mr. Cartmell proposed a trip to the **Lakes and Woods of Maine.** All seemed pleased with the idea.

CARLO.

"May I take Carlo, Papa?" earnestly inquired Nellie.

"Yes, my dear."

"I wish to carry my double-barrelled shot gun, Papa," said Fred. "I may meet a bear."



ANDROSCOGGIN LAKES, MAINE.

"You may take your gun, my boy. You may see some small game, but I doubt your meeting many bears."

George concluded to take his camera, and Florence and Miss Gray decided to carry sketch-books.

The ride to Maine the next day over the Boston and Maine Railroad was rendered very delightful by the fre-

quent glimpses of the ocean *en route*, and the short stop in Portland. At five o'clock they were in Bethel in a comfortable hotel.

While sitting on the piazza in the evening, Mr. Cartmell showed his friends a large map of the New England States (see page 24), and explained how the great rivers of Maine rise in various lakes about half-way between the shore and the borders of Canada.

"The Androscoggin River," said he, "rises in a series of lakes, five in number, in the western part of the State. The lower one of these lakes lies partly in New Hampshire and partly in Maine. This river flows first southwest, as if to become a branch of the Connecticut and discharge its waters into the Long Island Sound; but its course is suddenly arrested by the lofty barrier of the White Mountains, and a sharp turn is made into the Pine Tree State. The river finally becomes a part of the Kennebec just before the sea-coast is gained, and its waters reach the Atlantic hundreds of miles from the mouth of the Connecticut."

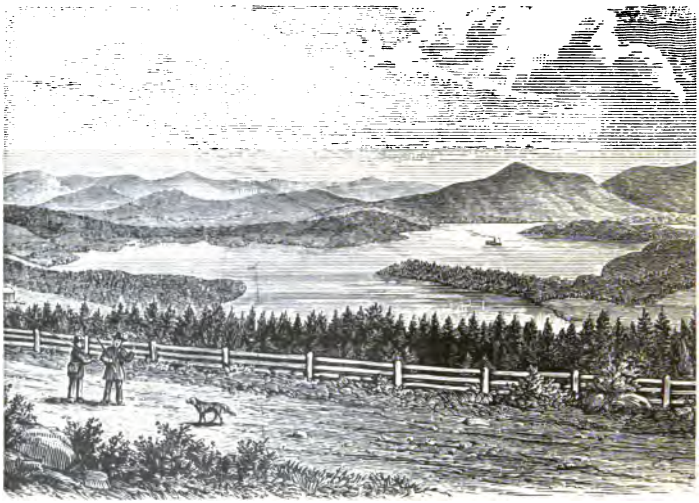
"Does n't the Kennebec River," asked Fred, "rise in the great Moosehead Lake, farther north?"

"Yes; and the Penobscot has its different sources still farther north, in a number of lakes about the base of Mount Katahdin."

The following morning the party were driven from Bethel through the Notch to the new hotel Lakeside, at the foot of Lake Umbagog.

Miss Gray and Florence on the following morning made sketches of the lake, and the boys went off fishing, while Mr. and Mrs. Cartmell and Nellie climbed to the top of Hampshire Hill, back of the hotel. The healthy

exercise in the fresh mountain air and bright sunshine gave them all good appetites for dinner. The boys returned with a basket of trout of fair size. They had many exciting adventures to relate, the most improbable



UMBAGOG LAKE.

being that they came across a bear's den which was left warm by the hastily retreating occupant.

A sail on the lake in the afternoon proved to be a new source of pleasure to each one. Miss Gray entertained them with songs and selections of poetry. The children were especially pleased with one stanza she recited, and asked her to repeat it several times because it seemed so appropriate.

"O'er no sweeter lake
Shall morning break or noon-cloud sail, —
No fairer face than thine shall take
The sunset's golden veil."

After several days happily spent in fishing, sailing, and sketching, the party went on by steamer to the next lake. To do this they had to sail the whole length of Umbagog. It was a most delightful trip, as the sky was clear and the grand peaks of the White Mountains stood out in full view away to the west. They found Umbagog a long, narrow, crooked lake, surrounded by dense forests and walled in by lofty mountains. The second lake is called the "Lower Richardson." About five o'clock they reached the Lakeview House at the south arm, or southern end of this lake.

The next day being Sunday the Cartmell family showed respect for the day by not going on fishing or hunting excursions; reading, conversation, and pleasant walks along the edge of the lake prevented the day from seeming long and tedious to the children, who were somewhat surprised to find they were beyond Church or Sunday-school.

Monday Mr. Cartmell, George, and Fred went out on the lake to troll for trout. This is done by using a suitable hook baited with live bait, for which small fish, as minnows or shiners, are generally employed. A long line is used which floats out behind the boat as the latter is rowed over the water. Father and sons took turns at rowing. At first they did not have a bite; but in about half an hour, as Fred was holding the line, something gave a sudden pull, and Fred exclaimed, "I have got him!" George came to his help, and their father stopped rowing.

"Be careful, boys, or you will lose him."

Back and forth that fish darted,—sometimes running under the boat, sometimes striking out for the shore,

the boys letting out the line, or pulling it in as well as they could, always trying to keep it taut. For twenty minutes the contest went on, Mr. Cartmell giving directions how to manage and the boys learning the lesson

TROUT.

faithfully. At last Mr. Trout became numb and his strength exhausted, and slowly he was worked up to the boat; and then their father put the landing net under him and lifted him into the boat, where he was tenderly cared for.

Several other trout were captured before it was time to return, but none which equalled the first one in size and beauty.

When the party returned to Lakeview, their success became the talk of the place, and revived endless fish stories. Trout number one weighed ten pounds and eleven ounces. Miss Gray, early the next morning, made a painting from it; and George, of course, had to photograph the whole catch as they were artistically displayed on a bed of green moss.

Then Mr. Cartmell packed the largest one in ice in a strong box and sent it by express to a friend of his, who sells fish in Quincy Market, Boston, where it attracted much attention.

The next stopping-place which Mr. Cartmell selected was Birch Lodge on the third lake, usually known as the Upper Richardson Lake, but always called by the Indians *Molechunkamunk*, which means, according to Winthrop, "Molly of the chunky mug."

While stopping at this place, the boys learned that some of the ponds near by have their shores lined with

VIEW FROM BIRCH LODGE.

grasses and lily-pads, which furnish excellent feeding-grounds for deer. They are hunted at night with a boat carrying a light whose rays are thrown out ahead of the boat, and thus attract the curiosity of the deer, until the hunter has a chance to fire the fatal shot.

Mr. Cartmell and George were invited to join a party of sportsmen who were getting ready for a deer hunt, but declined the pleasure, because it is not lawful to shoot such game in Maine till the first of September.

Leaving Birch Lodge, after a stay of two days, Mr. Cartmell and his family reached the Upper Dam in season to see the novel sight of driving the logs from lake to lake. The water, held back by the dam, was given its freedom by cutting the barricade at the sluice. It rushed through with a roar like Niagara. First came sweeping down from the lake above the great boats, long and narrow, called bateaux, each pulled by a dozen stalwart foresters, and guided by two others who are very giants in strength. The boats gained a fearful speed when they entered the sluice; the oars were trailed, and like an arrow from a bow they shot through into the boiling water below. Then the sturdy backwoodsmen bent to their oars as the boats rushed down the rapids, dodging immense bowlders, jumping little falls, and finally emerging on the quiet surface of the lower lake.

"Sometimes," said Mr. Cartmell, "a boat capsizes, or striking a rock in the middle of the rapids is broken to pieces in an instant, and the crew left to swim for dear life, or drown. Few men, however, are lost; so the danger cannot be so great as it seems.

After the boats had all run through, the logs began to follow. They passed through the sluice singly, in twos and threes, and sometimes a dozen at a time. Below the sluice they performed all kinds of capers. Some were thrown clear out of the water; others stood on end; most of them rolled over and over. At one time a number became piled upon one another in great confusion, form-

ing a jam, which was broken up by the dexterous use of the axe and pole in the hands of a skilled lumberman.

"I have read," said Miss Gray, "that the value of the logs going over this dam in one year is sometimes two million dollars."

"Who has built these immense dams, Papa?"

"The Union Water Power Company of Lewiston, to keep back and regulate the supply of water for the great mills in that city."

Later in the day they went on board the little steamer "Metalluc," for a ride through the fourth lake. Florence fortunately was invited by the captain of the steamer into the pilot-house.

"Why do you call your steamer 'Metalluc'? I never heard of that name before."

"It is named after a noted Indian chief who formerly lived on these islands by which we are sailing now, and whose beloved wife was buried on one of them."

"I suppose you have some long Indian name for this lake, have n't you?"

"Yes; we call it Mooselucmaguntic."

"What a funny name! Why is it so called, Captain?"

"I do not know, but I will tell you the story usually given. One day a hunter was out after moose, but met with such poor success, that he became almost famished. He had no fish-hooks or lines, and so he could not catch any trout. He went four days with nothing to eat but a few berries and green chestnuts. He was nearly starving, and sat down upon a log to rest. 'Suddenly,' the hunter says, 'I heard a tread, turned my head, saw a moose, — took — my — gun — tick! he was dead. I was saved, and in gratitude named the lake "Moosetookmyguntick."'"

LAKE MOOSELUCMAGUNTIC.

The name has been changed a little since then to make it more easy to pronounce."

Towards the end of the day the travelling club reached the Mountain View House, situated half way between the fourth and fifth lake.

After supper all went out to visit the buildings used for hatching and raising fish. They learned that about one million spotted trout are hatched here each winter, and distributed in the different Androscoggin Lakes. Half a million landlock salmon eggs, and one hundred thousand whitefish eggs are also hatched and placed in the lakes. This hatching house is supported and kept running by subscriptions from the fishermen who visit the lakes.

RANGELEY LAKE, NEAR THE OUTLET.

The next day a very small steamer carried them to the eastern end of the fifth and last lake, whose name, *Rangeley*, is frequently applied to all these lakes.

Mr. Rangeley once owned a whole township on the shores of this lake, and cut off a great amount of timber.

"This lake," said Mr. Cartmell, "is the highest in the Androscoggin chain. It is about fifteen hundred feet higher than the mouth of the Androscoggin River."

At the steamer landing carriages were waiting to convey them all to the Rangeley Lake House in the village. Here Mrs. Cartmell and the girls remained while the boys and their father explored the country beyond.

THE COAST OF MAINE.

Bright from many a rocky headland,
Fringed by sands that shine like gold,
Gleams the lighthouse white and lonely,
Grim as some baronial hold.
Bright by many an ocean valley,
Shaded hut and village shine ;
Roof and steeple, weather-beaten,
Stained by ocean's breath of brine.

I. McLellan.

A RIVER IN MAINE.

In hidden caverns, within the mountains,
Cold, crystal fountains, so clear and bright,
Well upward, sparkling, and downward foaming
Rush onward, roaming to find a light.

Off on the hillside a brook is dashing ;
In splendor flashing its waters run,
Out from the woodland, out from the bushes,
It gayly rushes to meet the sun.

Down in the valley two streamlets, meeting
In quiet greeting, together flow ;
By pools and eddies, where trout are rising,
With snares enticing the anglers go.

LESSON XIII.

IN THE WILDS OF MAINE.

MR. CARTMELL and the boys left Rangeley the next day for Portland, where they procured all necessary supplies

MOUNT KINEO.

for a long trip northward. From Portland they went by rail to Greenville, on **Moosehead Lake**, and from the latter place by steamer to Mount Kineo, half way up the lake.

MOOSEHEAD LAKE AND PENOBSCOT RIVER. ROUTE SHOWN BY DARK LINE.

Upon a peninsula at the base of this frowning pile of stone stood the great hotel where they were to spend a few days.

The first excursion on the following day was to the

VIEW FROM MOUNT KINEO.

top of Mount Kineo. While ascending the mountain, George wished to know the reasons for the name.

"Some writers say the Indians gave the name to the peak because when seen at a distance it looks like a moose, and the word Kineo meant, in the Indian language, *moose.* Others say the word Kineo means *high bluff.* No one knows certainly."

Before reaching the summit they found a spring of

sparkling, clear, cold water, flowing out beneath a mossy rock, very suitable to quench their thirst. At the top Mr. Cartmell called their attention to the situation of Mount Kineo at the narrowest part of the lake and half way from either extremity. He then showed how it was one in a range of mountains extending across the lake.

"Notice, boys, the rock of which this peak is composed is what we call flinty, or a hornstone. The Indians formerly came here in great numbers to get this rock for arrowheads and hatchets."

"What mountain is that far away to the east?"

"That must be Mount Katahdin, which I propose to visit in a day or two."

George wished he had taken his camera with him, as the views were so fine; but he purchased a number of photographs in the evening at the hotel.

Mr. Cartmell engaged an Indian by the name of Silas as guide for the long trip to Mount Katahdin. Under his directions a good birch-bark canoe was hired, and plenty of provisions secured.

The trip began in a pleasant ride to the head of Moosehead in the steamer "Governor Coburn." Here a good night's rest was obtained in a small hotel. The following day, the canoe and other articles were carried across the North-East Carry to the West Branch of the Penobscot River.

Then began the real work of the expedition. Silas took charge of the canoe, and father and sons obeyed his directions. At first the river is very smooth, and rowing quite easy. Silas showed them how to row, to paddle, to stand up and keep their balance, etc.

"Where were you born, Silas?" asked Fred.

"I come over from New Brunswick."

"Do you like Maine?"

"Yes, pretty well. I've larned the lon-gwage. Now I kin buy my own grub, and write my own letters. Hav' n't I done pretty well? Never went to school here. I worked the day and studied the evenings."

Now and then they stopped to fish. Fred at one place saw piles of fresh-water clam-shells, and inquired of the guide the reason for them. He told him that the musk-rats bring the clams from the bottom of the river, eat the meat, and leave the shells, very much as men do at the seaside.

There are many islands in this river, on one of which they stopped and cooked the fish caught, making a simple but substantial dinner in true backwoodsman's style.

About five o'clock they reached the wide part of the Penobscot, called Chesuncook Lake, and not far from the farm-house the tent was pitched for the first time.

Fred helped Silas put up the tent. First they cut and drove into the ground, ten feet apart, two heavy stakes with crotches at the top. Then a ridge-pole eleven feet long was cut and placed in its position, and over this was thrown and stretched the heavy canvas piece, and fastened to the ground with pegs. In the rear a triangular piece was buttoned on, mosquito-netting being used in front, in addition to a similar piece of cloth.

It took Fred and Silas about fifteen minutes to get the tent firmly "pitched;" meanwhile, Mr. Cartmell and George were busy bringing up from the canoe the provisions and cooking apparatus, the latter consisting of a coffee-pot, tea-pot, frying-pan, sauce-pan, tin cups, tin plates, knives, forks, and spoons.

Silas showed his skill as cook by the substantial supper he soon prepared, to which their keen appetites did ample justice.

After supper the beds were made of spruce boughs covered over with rubber blankets and a comforter. The

CHESUNCOOK LAKE, MAINE.

mosquitoes and black flies were driven out of the tent before retiring by the smoke from a *smudge.*

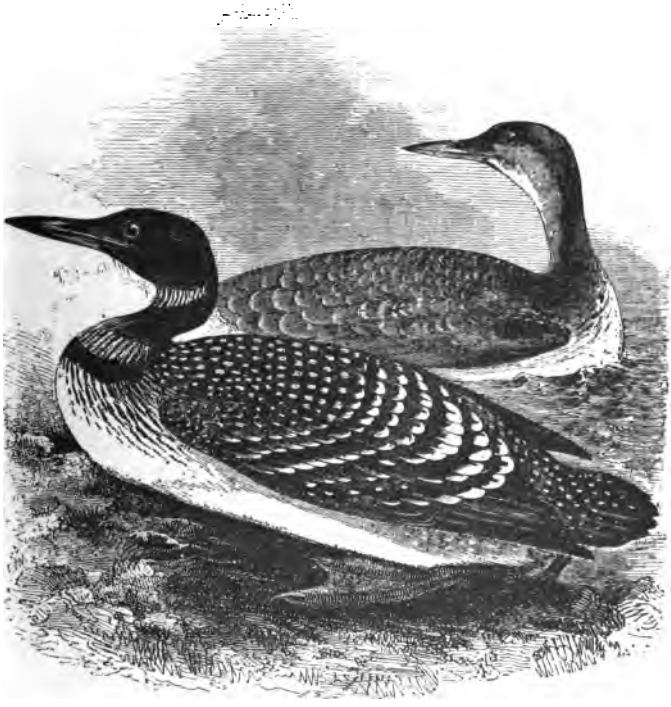
As they all gathered around the big camp-fire in front of the tent, after the sun had gone down, Fred heard a strange cry coming from some distance on the lake, resembling a little child in distress.

"What is that cry, Silas?"

"I reckon that be the loon."

"What is a loon?"

"The loon, Fred," said his father, "is a swimming and diving bird, often called the 'great northern diver.' I think Silas can tell you much about his habits."



LOONS, OR GREAT NORTHERN DIVERS.

"Please do, Silas," said Fred.

"I have seen loons a good many times. When they have their young with them, and a man comes near suddenly, the old birds go one way making a great noise, and the young uns go off a different way. If followed

the loon usually dives, and I 'ave known 'em to double on the hunters and swim under the boat and come up a long distance the other side. As they only put the head above water at such times, it 's very hard to find 'em."

"Did you ever shoot any, Silas?"

"Only a few times. The last one I shot was in a curious way. I was showing a boy how to make bullets skip on the surface of Moosehead Lake. I had seen a loon out in that part of the lake when we began to fire, and I saw it dive once or twice. I fired again, and as the bullet skipped along, that bird popped up just in its path and was killed. We all saw it done. I rowed out and got the bird, and gave it to the boy, who had it stuffed."

Again and again they heard the lonely, dreary cry of the loon. Mr. Cartmell asked Silas if it always made the same cry.

"Oh, no. It has different cries. It has the cry of alarm; the shrill cry when flying; and the sweet, loving cry in spring with its young."

While crossing the following day to the lower end of Chesuncook Lake, they saw at one point a small striped squirrel swimming in such a way as to show it was almost exhausted. Silas turned the canoe towards the poor creature, and when he came near, reached out the paddle and the squirrel climbed up slowly into the canoe, greatly to the amusement of the boys. Here he sat on the top of the tent bag and dried himself. As they approached the shore, Mr. Chipmunk jumped overboard and reached shore before the boat did, disappearing in the woods.

A beautiful place was selected for the camp the second night.

As they went on down the Penobscot, new scenes and adventures were constantly recurring. The river was ever changing its character. Sometimes it was a wide and peaceful lake miles in extent; then it seemed to become a rushing, noisy stream, with numerous rapids and falls, where Mr. Cartmell and the boys were obliged to leave the canoe for Silas to pilot along, while they walked beside the banks through briers and underbrush, till the guide's shout for them to join him was heard from some quiet nook below the dangerous place.

Glimpses of Mount Katahdin were frequently seen. While Silas and Fred were carrying the canoe over a long carry between two lakes, Mr. Cartmell and George climbed a hill, and from the summit obtained a splendid view of the great mountain twenty miles away to the east. Gray and bare it rose like a pyramid, showing on one side the evident marks of a great landslide.

At the mouth of Sandy Creek, Mr. Cartmell met a party of three persons, including their guide, who were returning from Mount Katahdin. The two parties pitched their tents near each other. Around the evening camp-fire they exchanged stories of recent adventure. Mr. Winthrop, one of the new-comers, gave so vivid an account of the difficulties of reaching the top of the mountain, that Mr. Cartmell concluded with some reluctance to give up that part of the trip.

While Mr. Cartmell and Mr. Winthrop sat around the fire enjoying each other's company, the guides and the boys strolled away from the camp. Standing a few moments perfectly still before an open space which was lighted up by the clear rays from the full moon, they saw a large male deer and his mate cross the opening. The

creatures seemed quite unconscious of their enemy — man — being so near.

As they came back to the camp, they heard a sudden rushing through the bushes on their right, and Silas cried

MOUNT KATAHDIN, MAINE.

out, "A bear, boys!" Upon reaching the canoe they found it had been turned over, and the bear had eaten up half the meat for breakfast.

Breaking camp the following day, both parties began to descend the great river. They had to cross wearisome

carries and paddle through many lakes before they came to Mattawamkeag, where civilization was once more enjoyed in the shape of houses, railroads, and telegraphs. Two weeks had been spent in the faithful birch-bark canoe in the wilds of Eastern Maine, on the largest river in the State.

Silas had proved a good and faithful guide, and he returned to his home well rewarded for his services.

Mr. Cartmell telegraphed to his wife of their safe arrival from the wilderness, and asked her and the girls to join them in Portland on their way home.

REVIEW QUESTIONS.

1. Where are these lakes?
2. Name the principal lakes.
3. Write the names of the rivers.
4. Where is the first lake situated?
5. How did the Cartmells spend Sunday?
6. Describe the trolling for trout.
7. How are deer sometimes hunted?
8. Describe "driving the logs."
9. Which lake is the highest?
10. Write or repeat one of the poems.
11. Where is Moosehead Lake?
12. Describe the visit to Mount Kineo.
13. Who was Silas?
14. What did he tell the boys about loons?
15. Describe the trip to Mount Katahdin.

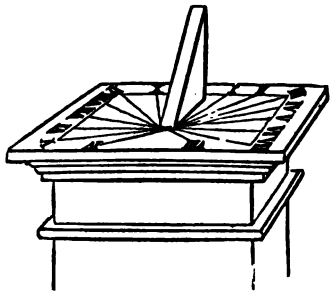
LESSON XIV.

TIME-KEEPERS.

MR. CARTMELL came into the sitting-room after supper, carrying in his hands the kitchen clock.

"What are you going to do, Papa?" Florence asked.

"I wish to show you the inside of a clock," he replied. As he was taking off the hands and removing the face, he asked, "Can any one tell what was the first method of measuring time?"



SUN-DIAL.

"It says in my reader, Papa," Fred replied, "that it was a sun-dial."

"What came next?"

"Water-clocks. How did they work, Papa?"

"The principle was very simple. A tall vessel was filled with water, which slowly ran out at the bottom and showed what part of the day had passed since sunrise, when it was filled. You remember cousin Amy's sand hour-glass. The water-clock was on a similar plan, water being used in place of sand."

"George, have you read in your history of any strange way of keeping time?"

"Alfred, one of England's best monarchs, who died in 901, kept time by burning candles. His candles were made so each would burn eight hours, or one third of a day."

"According to this history," said Florence, "clocks moved by weights and wheels began to be used in the monasteries of Europe about the eleventh century. St. Paul's Cathedral, London, had the first clock in England, in 1286."

RECOIL ESCAPEMENT.

Mr. Cartmell had now opened the clock so that all could see the movements within. "What is this, Nellie?" pointing to the part which swings.

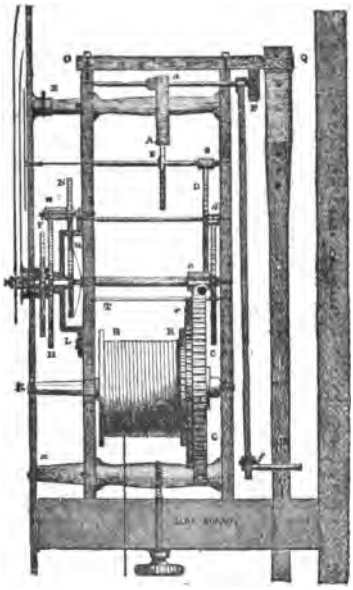
"That is the pendulum."

"A clock usually consists of six parts, — a case, a pendulum, an escapement, a train of wheels, a weight, or spring, and a face with the hands."

"Please explain each part."

"Notice that the upper part of the pendulum carries with it two bent parts called 'arms.' The ends of these arms are called 'pallets.' Between the arms of the pendulum is a wheel made and placed in such a way that as the pendulum swings to the left and then to the right, one tooth of the wheel passes one of the pallets. This wheel is called the escape wheel, because one of its

teeth passes by or escapes at each double swing of the pendulum. It is turned by the train of wheels, which are propelled by the weight or spring.



TRAIN OF WHEELS IN A CLOCK.

"In a modern clock the train of wheels usually consists of four; the first one, marked B R G, is moved directly by the weight or spring; the second one, marked C, or centre wheel, turns round once in an hour and carries the minute-hand. This is connected with a number of wheels at H and Y which regulate the speed of the hour-hand. The fourth wheel, marked E, goes the fastest; it generally has thirty teeth, and turns round once in a minute. The arbor of this wheel goes through the face and carries the second-hand."

"Are there different kinds of clocks?"

"Yes, they differ in many other respects than the shape and color of their cases. There are different kinds of escapement. The *recoil* has been already given. This is used in all common clocks. The *dead-beat* escapement was invented by an Englishman named Graham. It is used in the better clocks, such as we call 'French clocks.'"

"Where was the parlor clock made, Papa?"

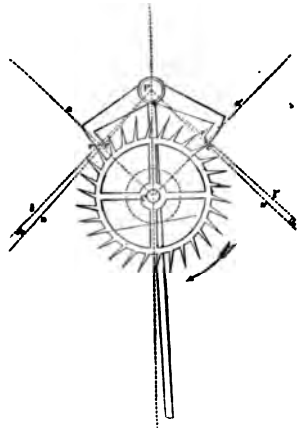
"That was made in Paris. The escapement is in sight in the face, to make it look pretty."

"Who made the big clock in the hall at the school building?" asked Fred.

"That is a Howard clock. That firm is noted for making accurate time-keepers."

"Why may we not go and see their factory, Papa?"

"We can. I will go tomorrow."



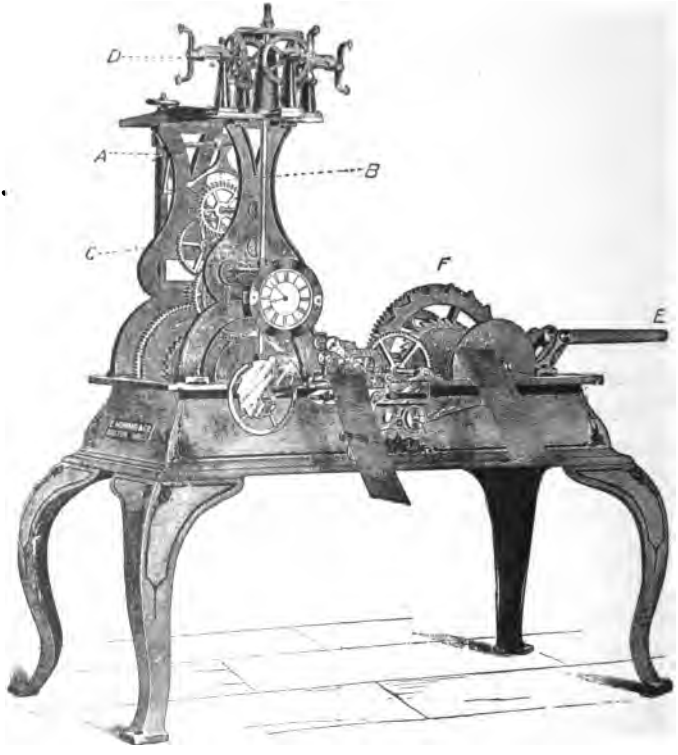
GRAHAM'S DEAD-BEAT ESCAPEMENT.

On reaching the factory in Roxbury, Mr. Carr, the superintendent, asked them what kind of clocks they desired to see first. Mr. Cartmell suggested *tower* clocks.

Mr. Carr led the way upstairs into a room where several of these large clocks stood ready for inspection. He explained to the children the different parts.

"We make two kinds of tower clocks; in the simpler kind the machinery only moves the hands; in the more common kind it strikes the hours also. In this tower clock, No. 3, the time-keeping part is at the left and the striking part is at the right." (See page 122.)

In the illustration A represents the wooden pendulum hung on a piece of thin, elastic steel-ribbon, so as to swing without any friction. B is the dead-beat escapement with steel pallet. C is a wheel which turns once an hour; this turns once an hour, by means of



TOWER CLOCK NO. 3.

proper connecting-wheels, the rods at D which connect with the *minute*-hands on the different dials in the tower. This hour speed is made, by a few wheels behind the dial, to turn the hour-hand once in *twelve* hours.

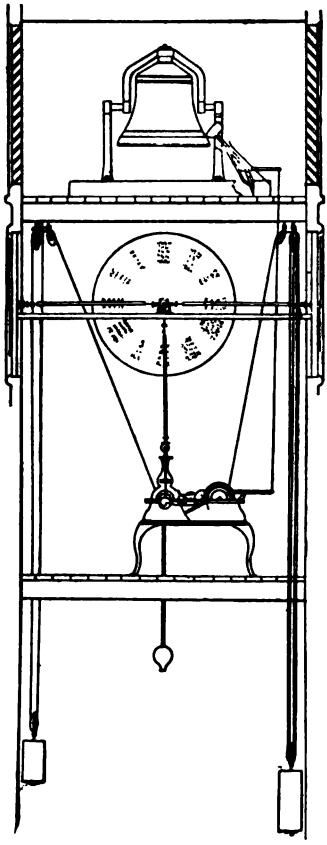
Below C is the great drum and wheel to which the weights for driving the clocks are attached by iron ropes. At F is the drum and attached weights for driving the

striking part. The weights are not shown in this picture. E is a lever lifted by the big wheel F; this lever pulls the hammer which strikes the bell in the tower.

Mr. Carr showed them a cut giving the relative position of the different parts in the tower clock. After the hammer is lifted it falls upon the bell by its own weight.

"Does it take much power to run such a clock, Mr. Carr?"

"A clock runs by means of power from a weight or spring carried to a barrel connected with a train of wheels. These wheels, forced on by the power, have a tendency to "run down" or stop; they would do so at once, if the escapement operated by the pendulum did not regulate the speed at which they can move. The more machinery there is in a clock, and the larger and heavier the wheels, the greater the power required. No. 3 requires an iron cord fifty-four feet long and a weight of one hundred and twenty-five pounds to drive the machinery.



TOWER CLOCK, SHOWING POSITION OF CLOCK, FACE, BELL, WEIGHTS, ETC.

"It is so regulated by the pendulum that it will run down in seven and a half days. The sexton of the church or the janitor of the building is supposed to wind the clock every seven days."

"Is it much work to wind such a clock?"

"Yes; it takes five minutes or more, and it is quite hard work. Between two of the wheels there is a powerful spring to keep the clock going while the man is winding."

Florence inquired what material is used for the different parts.

"The different parts of the tower clock are made of metal. The frame is made of cast-iron; the wheels are of hard hammered brass, cut by machinery in the same manner as the watch wheels, only on a larger scale; the arbors and pinions are of the finest cast steel."

"What kind of wood do you use in the pendulum?" asked Fred.

"We have found by experiment that cherry, well dried, is the best wood, because it is affected the least by changes in the weather, either of heat and cold, or of dampness. You see that the pendulum is not hung on a pivot as in ordinary clocks, but it is suspended on this spring (A) so that it moves without friction.

"If you will step this way I will show you a larger and better tower-clock. This one has the well-known Dennison gravity escapement, which reduces errors of minutes to seconds. It is used in the celebrated Westminster clock, London. Instead of a wooden pendulum, we furnish with this a compensated pendulum made of iron, steel, and zinc in such a way that the change of length in the iron part produced by a change of temperature is balanced

by a different change in the zinc part, so as to keep the pendulum always the same length."

"What is the price of such a clock, Mr. Superintendent?"

"It is, with all these iron fixtures, pulleys, rods, weights, dials, and hands, seventeen hundred dollars. Such a clock will keep time about as well as the Westminster clock, which cost thirty thousand dollars."

WATCHMAN'S CLOCK.

Mr. Carr then took them into another room, where the hands, dials, and figures are made. From that floor they went in the elevator to the next floor, where they saw men making and putting together a great variety of clocks, principally for halls, offices, and railroad stations.

"Have I not seen your clocks in jewellers' stores?"

"We furnish a large number of *regulators* for that kind of business. They are supplied with the second hand, the dead-beat escapement, and the mercurial pendulum, and are warranted to keep the best of time."

"What kind of a clock is this one, Mr. Carr?" George asked, as soon as he entered one of the rooms.

"Do you mean the large one in the corner?"

"Yes."

"That is what we call the watchman's clock, or the

clock which tells tales. The object of this clock is to record the goings and comings of the night-watchman in a factory, hotel, or any large building. This clock is connected by wires with the various rooms of the building into which the watchman is expected to go, say every hour, during the night. In each of these rooms there is a *station;* that is, a little metallic box into which the watchman inserts his key and gives one full turn.

"On releasing the key the circuit is completed, and the electric current passes along the wires and starts the machinery in the clock for making on the dial the record. The dial you see is a round disk of stiff paper, divided into twelve main parts, one to represent each hour. These are subdivided into quarter-hour and five-minute spaces. I will show you how it works."

Mr. Carr asked the man working on clocks to step into the next room and turn the key in the little box. He did so, and the children saw the little hammer at the side of the dial move forward and make some dots on the paper, and then move back again. In five minutes the man turned the key again. The hammer did the same as before, but the dots were placed in the next space, as the dial had turned a little. Then Mr. Carr took the dial out, and the children saw that the dots were arranged in this way • • •, which means the watchman is at station or room 12.

Then Mr. Carr gave George the key, and told him to go into another room and turn the key in the box. George did so, and all remained near the clock. The hammer acted promptly. When they examined the record it consisted of four dots, thus • • • •, which meant "box number 4."

When Mr. Cartmell thanked Superintendent Carr for his kindness, Mr. Carr invited him to visit the watch factory at his earliest convenience. On their way home, Mr. Cartmell told the children about the curious clock in Berne, Switzerland, which shows a troup of wooden bears when it strikes, and above these a large rooster which claps his wings and crows like a live bird. Then he described the more wonderful Strasburg clock, which stands on the ground floor, in one corner of that famous European Cathedral. When it strikes, a great many figures appear and do several wonderful things.

"I have a picture of this clock, which I will show you in the evening."

STRASBURG CLOCK.

LESSON XV.

MAKING WATCHES.

On their way to the **Howard Watch Factory** in Roxbury, Florence asked her father, —

"Which were made first, watches or clocks?"

"Clocks. It was a long time before any one thought of how to do away with the pendulum. At last, in 1500, Peter Hele, of Germany, invented the main-spring to take the place of the weights, and Dr. Hooke, of England, invented the hair, or balance-spring, and the balance-wheel to take the place of the pendulum. The other parts of the watch were then, and are to-day, about the same as they are in a clock, except in respect to size."

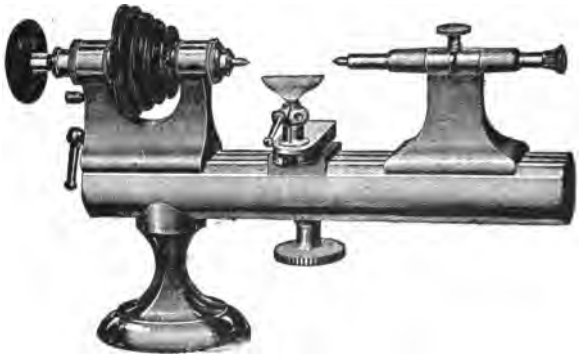
LADY'S WATCH.

"Is my Waterbury the simplest kind of a watch, Papa?" Fred asked.

"It is one of the simplest, as it has only fifty-four parts, or less than one third as many as there are in your mother's watch, although it is somewhat larger."

The Cartmells found the superintendent of the watch department as kind and polite as the one in charge of the clock department. He went with them and carefully explained the different operations to the children.

In the first room they saw a workman take up a "bottom plate," which consisted of a plain disk of brass less than two inches in diameter, and fifteen hundredths of an inch in thickness. He drilled four holes in this plate near the edge. Then another workman took the plate and made several cavities in it to receive the steel barrel and other parts of the watch. The third workman made thirty more holes in different parts of the same plate, of five different sizes. These holes were to receive different



WATCH LATHE.

parts of the watch. In this room about half a dozen persons were at work.

In another room they saw a young girl, not over sixteen years of age, running a machine "to mill and drill" a part of the watch called the pallet-bridge.

"Time is money with us, Mr. Cartmell," said Superintendent Learned, "and here you see how we save expense by gluing a large number of small wheels upon this disk, and grinding and polishing about twenty of them at once."

The superintendent next showed them how the fancy ornamental figures are cut on some of the wheels and the top plate by machinery, moved by skilled hands. Three men were busy in this "damaskening," as it is called.

"We use about twenty loaves of bread each day," said Mr. Learned, looking at the children.

"What for?" they eagerly asked.

"The soft part is mixed with oil, and is very useful in small quantities to clean off the dirt and oil from some small parts of the watch while in process of making, and also in polishing the fine metal work."

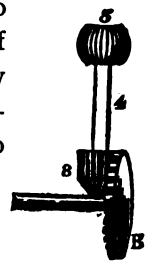
"The finest steel wire," Mr. Learned explained, "is used in making the hair-spring. It is reduced to its proper size by being drawn through fifty holes, one after the other, each one smaller than its predecessor. It is then flattened between hard plate-rolls. When this part is finished, the wire is five one-thousandths of an inch wide and one fifth as thick. About six inches of this wire is cut off for one spring; three of them are wound up and put in a copper box about the size of a dime. Enclosed in this box, they are put into the fire to be hardened and tempered."

"Please show us the main-spring, Mr. Learned," Fred asked.

"Here are half a dozen of them. You see they are made of the toughest and most elastic steel, about twenty-six inches long. When wound up, each one will easily go inside of this little steel barrel, which in our watch does not move as in most other watches. The main-spring is made fast to the arbor of a wheel and turns the wheel which turns the train of wheels in the watch."

"Are your watches stem-winders?"

"Yes, all of them. Most of them wind and set at the stem. If you will look at this half finished watch you will see the wheels used for winding and the manner in which the change is made from winding to setting by throwing one set of wheels out of gear and another set in gear, to be moved by the turning of the stem. It takes twenty-two different pieces to perform these two operations."



STEM-WINDING ARRANGEMENT.

"Do you make your own dials, Mr. Superintendent?"

"That work is done in these small rooms. The body of the dial is made of copper. The enamel is made of French clay, feldspar, and one or two other materials. This is placed over the copper, and each dial is laid in this furnace, heated to a glow, and baked for thirty seconds. When it comes out the face is hard, and will take polish like the finest porcelain. Step this way, and you can see the men painting the figures and words on the dial with a permanent black varnish. This has to be baked in like the painting on porcelain."


STEM-WINDING PARTS.

In another room the party were shown very ingenious machines for cutting the teeth on a dozen wheels at once, by little sharp-cutting circular-saws, less than an inch in diameter, which pass over the edges of the wheels and

cut a furrow along the edge just the right depth. After the first cutting the teeth are rough, and they must be dressed off by another cutter. This is not enough; a third cutter must give to each tooth the right curve and bevel.

DISK NO. 1.

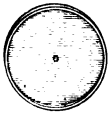
"Why, Papa," said Nellie, "how many times the parts have to be gone over before each one is ready!"

DISK NO. 2.

"It is marvellous how much work is necessary to make a first-class watch. Mr. Learned, did you ever reckon the number of operations necessary to make a watch in your factory?"

DISK NO. 3.

"Before answering your question by giving the exact number, let me illustrate the same by showing the various steps in making a compensation balance-wheel. In this box I have the process shown in these metal disks. In the first place a disk of steel is punched out and drilled like No. 1; then this is placed within a brass ring, as you see in No. 2. These pieces of metal are subjected to sufficient heat to melt them into



DISK NO. 4.

DISK NO. 5.

DISK NO. 6.

NO. 7, BALANCE-WHEEL.

NO. 8, BALANCE-WHEEL.

one firm body, and they appear like No. 3. This little body of solid metal is *faced* in a lathe, and when turned it looks like No. 4. Two slits are now cut across the

disk on each side of the centre hole, both of which are plainly shown in No. 5. The remaining parts are next cut out by an ingenious machine which leaves the centre bar, and the disk looks like this one, No. 6. A man then takes each one separately and files the inside of the rim to remove the stock left by the turning tool; the next man drills twenty small holes in the rim of the wheel seen in No. 7. After the holes are made, he cuts threads in them by another machine for the delicate gold screws we use to fill them. When the wheel has been polished, the screws inserted, and undergone several other operations, it is finished at last, and looks like No. 8. A balance thus made of different metals is not affected by heat or cold, and hence moves regularly."

"How wonderful! If there are so many operations needed to make one wheel in the watch, it must take more than a thousand operations to make the whole watch, Mr. Superintendent."

"You are very modest, Mr. Cartmell. I once counted them. It requires at least twenty-four hundred operations to make one of our watches, not counting any for the case, which we do not make."

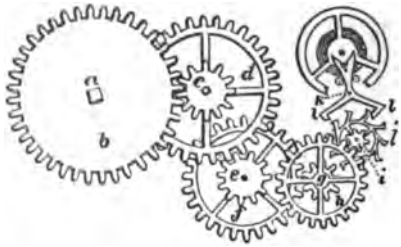
"What kind of watches do you make, Mr. Superintendent?" George asked.

"All our watches are detached levers with patent regulators."

"Please explain," asked Fred, "what the lever does."

Mr. Learned was very skilful with his pencil, so he drew on paper a sketch of the important wheels and springs in a watch, and explained. "*B* is the barrel containing the main-spring, *a*. The centre wheel, *d*, is

driven by the great wheel, *b*. The centre wheel revolves once an hour. It drives the third wheel, *f*, which drives the fourth wheel, *h*. This wheel carries the second-hand, and drives the scape-wheel, *j*. The lever, marked *k*, and balance-wheel above, which act like a pendulum and regulate how fast the watch shall run down, are placed near the scape-wheel. I will draw a larger figure to illustrate the lever.

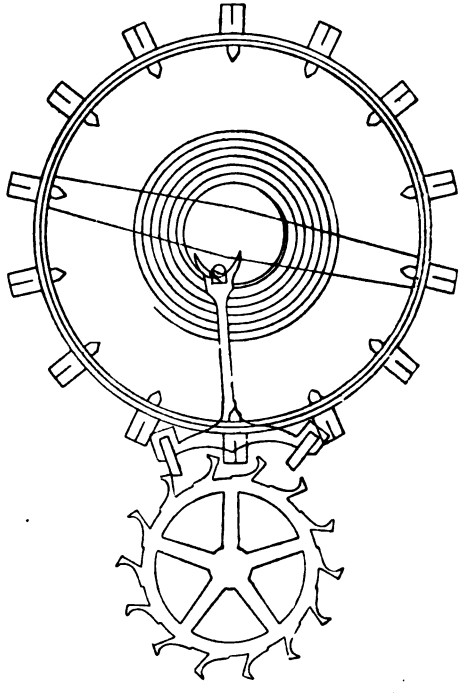


TRAIN OF WHEELS, ETC., IN A WATCH.

"The lever moves back and forth in such a way as to allow, each time, one of the teeth in the scape-wheel to pass. The balance-wheel and hair-spring regulate the movement of the lever, which in some of our watches is quite small, less than half an inch in length. The peculiar shaped teeth on this scape-wheel are called *club teeth;* they are used in high grade watches."

As they were passing from room to room, Mr. Cartmell remarked, "I see you use a great many machines. In almost every room we have been a number of different, but very ingenious, machines have been in operation. We have seen machines for cutting little screws from steel wire, for cutting threads on one end of the screw, for cutting a groove across the head, for making the leaves on the pinion, for cutting the teeth on the wheels, for polishing the steel parts, and so many other things which I cannot remember. Where do you get these wonderful machines, Mr. Learned?"

"We make both the machines and the tools we use in our *tool department.* We have, besides the ordinary lathe, more than fifty different and special machines."



DETACHED LEVER, HOWARD WATCH.

Mr. Learned then led the party to the *stock* room, to which the different parts of the watch are brought from the factory when finished. Here the parts are received by the foreman, and due credit given to the department furnishing them. The different parts of the watch are kept in small bottles in a cabinet.

The superintendent showed and explained the strange contents of these bottles.

Some contained steel screws so small they looked like black grains of sand, and it would take three hundred thousand of them to weigh a pound. Another little bottle had a large number of steel pivots, each five hundredths of an inch in length. To cut, turn, polish, and finish as many of these as could be made from a pound of steel

would cost ten thousand two hundred and sixty-four dollars in labor. In other bottles were seen the various wheels, springs, screws, and levers which go to make up the necessary parts of a good time-keeper.

"How many different parts do you have in your watches, Mr. Learned?" Florence asked.

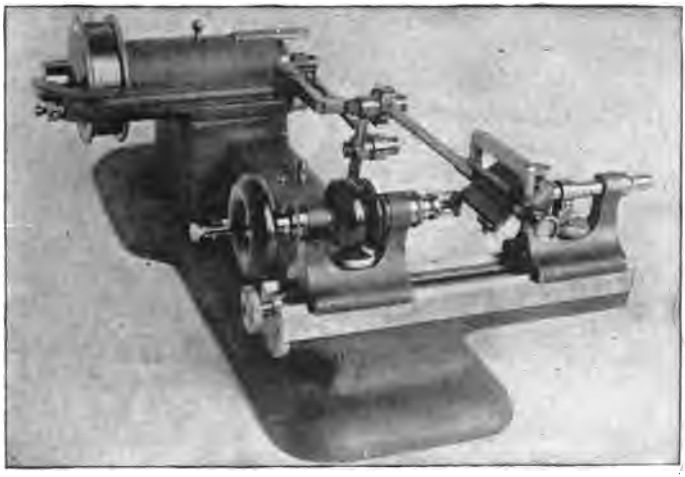
BALANCE, PINION, AND JEWEL DEPARTMENTS.

"There are one hundred and seventy-five different parts, which you can see by counting the different bottles and boxes on these shelves. Every part is carefully measured and weighed before it is used in the watch."

In the last room visited the watches are adjusted. This was explained by their friend, thus:—

"When the gold screws are put in the rim of the balances, they are located as nearly as possible to the position they are to occupy when adjusted to heat and cold before actual trial is made. The balance is then put into the

watch, set running, and the time taken; after which they are put in the ice box and run for a certain number of hours; then they are taken out, and the time noted, so as to see how much they have gained or lost in the cold. Afterwards they are put in the 'hot box,' and run for the same



POLISHING MACHINE.

length of time; and when taken out the time is again noted, to see how much they have gained or lost in the heat. Then such changes are made in the position of the screws as may be deemed necessary, and the same ordeal is repeated until the watch will run the same whether in the heat of summer or the cold of winter. This is called adjusting to heat and cold. The adjusting to positions is done in a similar manner after the watch is finished. The process of adjusting to positions takes on an average about six weeks."

Going home, Mr. Cartmell called the attention of his children to the courtesy shown them by the superintendents of the watch and clock factories.

"What else did you notice in each man, George?"

"He was very patient."

"A watch or clock maker of course ought to be patient. What else?"

"He was very enthusiastic about his business."

"Yes, that is very important. Did any one notice anything else?"

"Each man seemed to know thoroughly the business in which he was working," Florence replied.

HOWARD WATCH MOVEMENT.

"Yes, each one knew *thoroughly* the business in which he was engaged. He knew the theory, the science, and the practical part. He knew every part of the watch or the clock. I dare say Mr. Learned could put a watch together blindfolded or in a dark closet. Because of this complete knowledge he is superintendent, and receiving twenty times as much pay as any workman who knows only one part of the watch, although he may know that one part very fully."

The next day the children and their father went by rail to Waltham to see the largest watch factory in this country. They found an enormous building, nearly seven hundred feet long, erected on the banks of the Charles

WATCH FACTORY, WALTHAM, MASSACHUSETTS.

River. The floors of this building cover nearly five acres.

In some rooms everybody was at work upon the mainspring; in others the workmen made balances or screws or dials. Nearly all of the one hundred and fifty parts of the watch are made by machinery, and made so accurately that when "set up," very little change is needed to produce a good time-piece.

"How many operatives do you employ, Mr. Guide, in this great manufactory?" Fred asked.

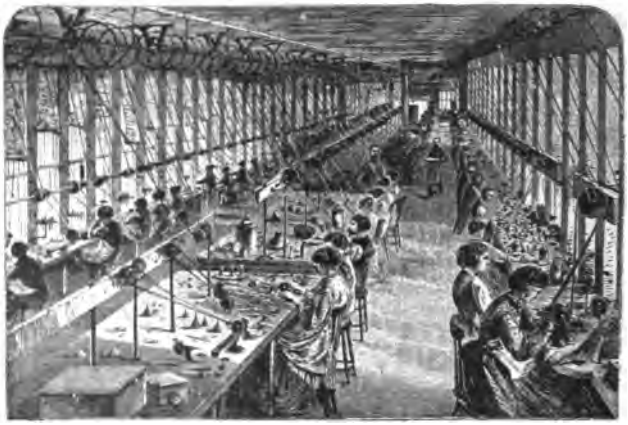
"About twenty-five hundred, over one thousand of whom are women."

"How many watches do you turn out in a day?"

"Two thousand."

"Where do all these watches go?" George inquired.

"Well, perhaps one thousand are sent to the New York office; part of these go to Mexico and part to England. Six hundred are dispatched to Chicago, where they are divided into small lots and sent to St. Louis, St. Paul, Milwaukee, Kansas City, etc. Four hundred are sent



ROOM IN WATCH FACTORY, WALTHAM.

to the Boston office, one hundred of which will go to Montreal."

In talking with the superintendent of the factory, after

ANOTHER ROOM IN WALTHAM WATCH FACTORY.

dinner, Mr. Cartmell learned that the mayor of the city works in the watch factory; so do half the aldermen. The editors of the two largest papers in the city once worked in the factory. From the factory have graduated many men of note.

Over one fourth of all the married men in the factory are owners of the houses in which they live. The Company has helped them to purchase, or build, with loans of money. The Company has established and keep in order lawns and gardens surrounding the works, and one or two beautiful parks. The healthfulness of the locality, the excellent sanitary conditions of the buildings, and the reasonable hours for work, make the death-rate among the operatives very low.

Mr. Cartmell came away feeling that he had seen "a model factory in a model city."

DRAWING LESSON.

CHILDREN between nine and twelve years of age can sketch many of the illustrations in this book. The following are specially recommended as not too difficult for pupils to attempt. They are found on previous pages: —

Mr. Cartmell's House, Town Hall, Library, Schoolhouse.

Chinese and negro faces, comparative areas, inside of picker, the beam, thread mill, machines for making shoes.

Bunker Hill, Bennington Monument, scales, lower case, presses, trout, loons, map of Androscoggin Lakes, Mount Kineo, Mount Katahdin, Carlo.

Sun-dial, clock escapement, plan of tower clock, watch lathe, stem-winding arrangement, balance-wheel, detached lever, train of wheels in a clock.

LESSON XVI.

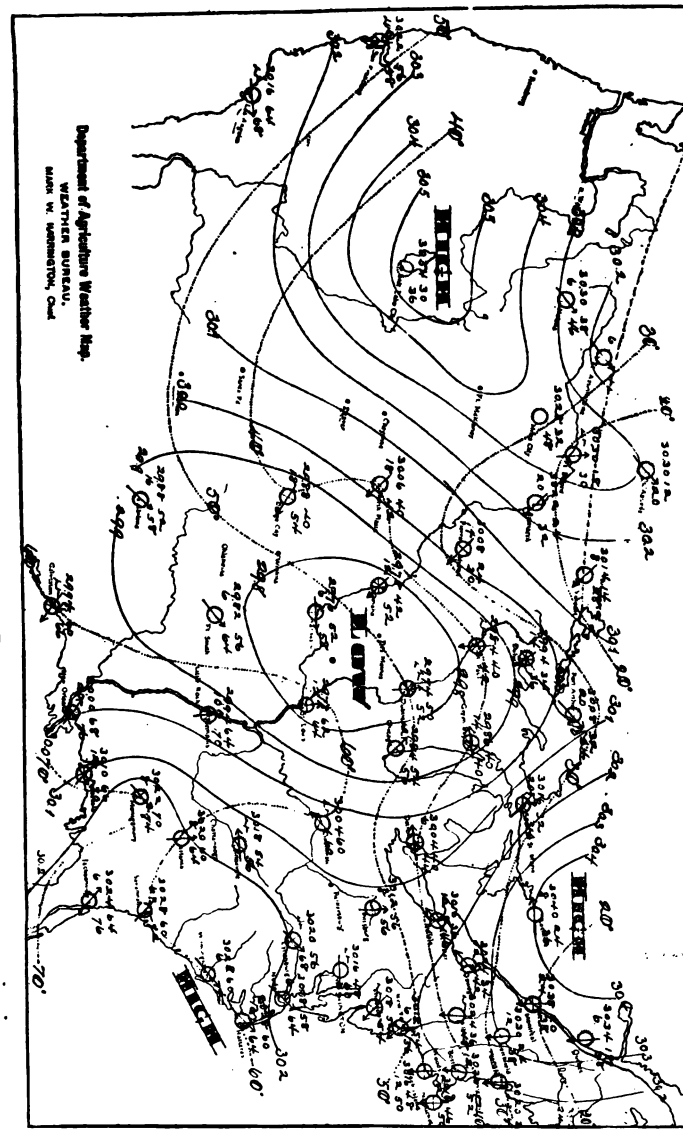
THE WEATHER.

MR. CARTMELL frequently brought home from Boston copies of the weather map. The children were interested in examining them, and in reading the predictions for the day, and in comparing them with the actual weather.

In a short time they learned that the weather map shows the stations in the United States and neighboring countries where weather observations are taken daily at 8 A. M. and 8 P. M., 75th meridian time, and telegraphed to the principal cities. These observations consist of readings of the barometer, thermometer, direction and velocity of wind, state of sky in reference to clouds, and amount of rain or snow fall.

The principal lines drawn on the weather map are called *isobars*, or lines running through places where the barometer readings are the same. A separate line is drawn for each difference of one tenth of an inch in the height of the barometer. Dotted lines, called *isotherms*, connect places of the same temperature. The direction of the wind at each station is indicated by arrows which point opposite to the way a vane points.

"In the last weather map which I brought home," said Mr. Cartmell (and which is reproduced reduced in size on page 143), "there are plainly indicated three high pressures of the barometer and one low pressure. The low pressure


Department of Agriculture Weather Map.
WEATHER BUREAU.
MARK W. HARRINGTON, Chief.
HIGH
LOW
HIGH
HIGH

WEATHER MAP.

in the Upper Mississippi Valley indicates a storm centre, which will probably move eastward during the next two days, and its centre will probably reach New England in about thirty-six hours."

"How fast do the storms move, Papa?"

"Their average rate is about six hundred miles a day."

"In what direction does the wind blow?" George asked.

"Notice most of the arrows point towards the centre of the storm. A wind in any given place is very frequently from the opposite direction in which the storm is moving. Usually the wind at some distance east of a storm centre is from the south, and west of the storm centre from the north. This fact is not so plainly shown on this map as on some others I have brought home. Warm weather, therefore, is generally experienced before the storm, and cold, clearing weather afterwards."

OBSERVATION SHED.

"How pleasant it would be to have every morning at the school a weather map to examine!" said Miss Gray.

"The agent in Boston, Mr. Smith, will send you one if you will only make application."

"I will do so to-morrow, for we can study geography as well as the weather from these maps."

George became so interested in the weather that he made an observation shed, according to the directions given in the weather-bureau reports, in which he placed a thermometer and barometer, and carefully noted the standings day by day.

"I have found the thermometer constantly changing," said George. "The barometer varies from day to day, and rarely do we have two days alike here in Lake View."

"Mark Twain has well described the changeableness of the New England weather," said Mr. Cartmell. "Can you, George, repeat the part you once gave in a declamation?"

George repeated: —

"There is a sumptuous variety about the New England weather that compels the stranger's admiration — and regret. The weather is always doing something there; always attending strictly to business; always getting up new designs and trying them on people to see how they will go. But it gets through more business in spring than in any other season. In the spring I have counted one hundred and thirty-six different kinds of weather inside of four and twenty hours.

"Yes, one of the brightest gems in the New England weather is the dazzling uncertainty of it. There is only one thing certain about it: you are certain there is going to be plenty of weather.

"As to the size of the weather in New England, — lengthways, I mean, — it is utterly disproportionate to the size of that little country. Half the time when it is packed as full as it can stick, you will see that New England weather sticking out beyond the edges and projecting around hundreds and hundreds of miles over the neighboring States. She can't hold a tenth part of her weather."

"You must remember, children, such a view is very funny, and all the more so because it is partly true. The weather in Missouri is just as changeable as in Massachusetts. People who go West or South and stay a few years learn to appreciate the New England weather.

"Do you remember the fine sleighing we had for several weeks last winter?"

"I do," replied Nellie.

"I remember the ice storm," said Florence. "How magnificent it was!"

"I read the other day a fine description of that storm," said Miss Gray. "One paragraph was as follows: —

"'Then the wind waves the branches, and the sun comes out and turns all those myriads of beads and drops to prisms that glow and burn and flash with all manner of colored fires, which change and change again with inconceivable rapidity from blue to red, from red to green, and green to gold; the tree becomes a sparkling fountain, — a very explosion of dazzling jewels, — and it stands there the acme, the climax, the supremest possibility in art or nature of bewildering, intoxicating, intolerable magnificence.'"

"What delightful weather we had while in Maine!" said Mrs. Cartmell.

"The weather," said Mr. Cartmell, "of course differs greatly in different sections. Our winters are usually cold and snowy. In contrast with such a climate think of the climate in southern California or in Florida, where the weather in January and February is mild enough for persons to sit out doors all day long, and enjoy the perfume from beds of roses and pansies. The changes from day to day are very small, but the nights are much colder than the days."

"Are not some sections in the West very dry?" Mrs. Cartmell asked.

"Most of the Pacific plateau region is very dry, but the mountains to the east or west are abundantly supplied with snow and rain. The mountains in Washington, Oregon, and Alaska, like a great arm, gather in the moisture from the western winds, and rain falls in abundance.

"In Boston the thermometer rarely drops below 12° be-

low zero. In St. Paul, in Minnesota, it sometimes goes down to 42° below zero. In Key West, Florida, 41° above zero is the lowest temperature. This difference in the extremes of temperature is called the *range*. In Boston the range is about 110°. In northern Montana thousands of people experience without apparent injury the enormous range of 160°."

"Where is the daily range the smallest, Papa?"

"Along the coast, in Florida and in southern California, where the changes are frequently only 2° in twenty-four hours. Boston has numerous changes for a seaport; but the extreme changes of temperature take place on high land, away from the ocean. The thermometer has been known to fall in Helena, Montana, 55° in one day. In Arizona it sometimes rises 65° in a single day."

"Where do the storms come from?" Nellie asked.

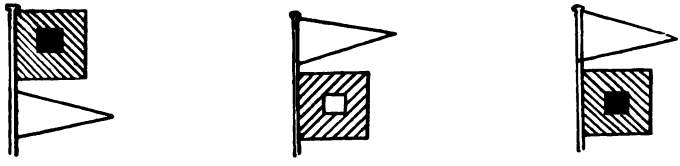
"Storms in the United States," said Miss Gray, "have their well beaten paths as much as wild animals, or carefully directed ships. Most of the cold waves begin in the Rocky Mountains and pass eastward, so that a cold wave in winter is often predicted in New England several days before it arrives.

"A very common path for storms is from Manitoba eastward to the Gulf of St. Lawrence. In winter storms sometimes pass from Dakota southeastward towards South Carolina. Many storms start near the Gulf of Mexico, move up the valley of the Mississippi, then turn eastward and finally reach New England.

"The reason we know so much more now about storms, ranges of temperature, and other matters pertaining to the weather, is due to the work of the weather bureau during the last fifteen years."

"Yesterday," said George, "I saw the storm signal flying when I was in Boston. It consisted of a white pennant and a red flag with black centre. I wonder what it meant?"

"Those flags," replied his father, "meant, 'The wind is northwesterly, and the coming storm is expected to be of marked violence.' Formerly the weather bureau displayed flags to show clear weather, rain, a cold wave, etc. But the frequent display of these flags created confusion



FLAGS.

among the sailors who were too far away to distinguish the colors. Now at the Boston and other stations flags are used only to tell the direction and force of the wind. Two flags and two pennants are used for this purpose. A white pennant above a yellow flag with white centre means northwesterly winds and a moderate storm; the same arrangement of red flags would predict a severe storm from the same direction. If the pennant is below the flag it means a southerly wind; hence a red flag above a red pennant means a southeasterly wind and a severe storm."

The children became so interested in the weather signals that they asked for more information, and Mr. Cartmell's reply was, "Let us visit the weather-bureau office when we next go to Boston, and learn in this way more about the service."

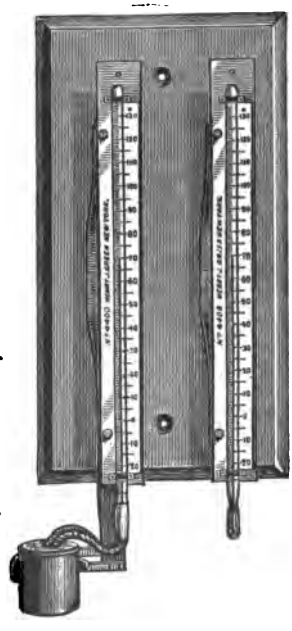
A few days afterwards they all presented themselves at the door of the weather bureau, at the top of the post-office building, and Mr. Smith, the agent, cordially invited them in, and explained his work and the instruments used.

BAROMETER.

"What would you like to see, Mr. Cartmell?"

"Please show the children first the instruments you daily use in taking your observations."

"We have two sets of instruments, — the plain and the self-recording. All of these instruments are placed above this room, outdoors, upon the roof of the post-office building. We have duplicates in this office. Some of them are connected with self-recording arrangements in this room. The barometer made in this style indicates the air-

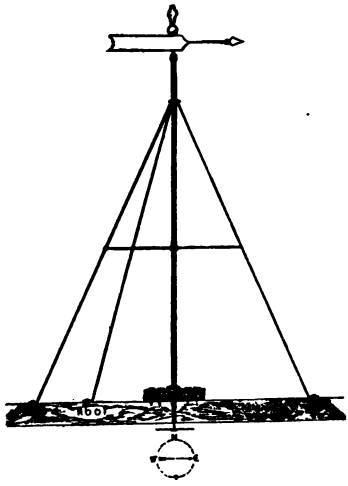


WET AND DRY THERMOMETER.

pressure very accurately. A special aneroid barometer is used and connected by wires with this self-recording instrument. Variations are faithfully recorded upon white paper as it revolves around this cylinder.

"For taking the temperature we use a *maximum* thermometer, made in such a way that the highest point reached by the mercury during the day is indicated by the mercury remaining fixed at that point till it is reset for the next day.

"We also use a *minimum* thermometer, filled with alcohol and carrying a small black glass-index. On a decrease of temperature the alcohol recedes, taking with it the glass index. If this is followed by an increase of temperature, the alcohol alone ascends the tube. The temperature outside is indicated on paper by this somewhat delicate instrument under this glass case."



WEATHER VANE.

"How do you tell the amount of *dampness* in the air?"

"The dampness is usually shown by the readings of a dry and a wet thermometer, hanging side by side. (See page 149.) The difference in the two readings shows the amount of vapor in the air. The wet thermometer, you see, is merely a dry bulb covered with soft muslin well wet with water drawn from a cup by a wick."

"Does the arrow on that dial show the direction of the wind, Mr. Smith?" Fred inquired.

"Yes. The vane is above on the roof, and its movements are shown on the dial above our heads."

"How do you measure the *velocity* of the wind?" Miss Gray asked.

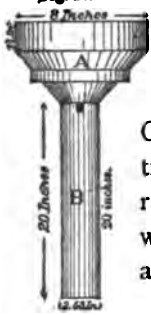
"It is measured by cups fastened to the ends of two horizontal rods crossing each other at right angles. These rods are supported by an upright rod which turns and sets in motion index wheels, or records the velocity in one of the machines at this table. The cups are so mounted that they move one third as fast as the wind. If they revolve five hundred times in an hour, the wind would be moving at the rate of a mile an hour."

CUPS FOR MEASURING THE VELOCITY OF THE WIND.

Mrs. Cartmell then asked Mr. Smith to explain how they measured the amount of *rainfall.*

Mr. Smith replied: "The fall of rain in any place is measured by the amount collected in a funnel-shaped receiver called a rain-gauge. The top of the funnel is 8 inches wide, and the cylinder receiver below is 2.53 inches in diameter and 20 inches long. The area of the top is ten times the area of the bottom, so one inch of rain in the lower part means that there has fallen one-tenth of an inch."

Fig. 22.



RAIN GAUGE.

The next term Fred made a vane and placed it on top of the schoolhouse. George made for him an observation shed, which he set up in the schoolhouse yard. His father and Miss Gray furnished the needed instruments, and the tinsmith in the village was ordered to make a rain-gauge. Careful observations of the weather were taken twice a day at school and reported at the evening meal.

Below is given an extract from Fred's weather diary: —

July 1. Wind north: clear, cool. Thermometer, 68° — 78°. Barometer, 30.4 — 30.24.

July 2. Wind south: sultry, hot, and dusty; heat lightning in the evening. Thermometer, 80° — 89°. Barometer, 30.1 — 29.94.

July 3. Wind southwest: sun rose red, hazy. Severe thunderstorm at four o'clock; two trees struck near home. Thermometer, 85° — 93°. Barometer, 29.9 — 29.54.

Florence and Nellie also kept weather diaries, but it is not necessary to reproduce them, as they were similar to Fred's.

LANGUAGE LESSON.

WRITE a composition about the WEATHER. Tell something about these points: Weather maps, storms, New England weather, the range, storm signals, the barometer, thermometers, weather-vane, velocity of the wind, observations, weather diary.

LESSON XVII.

THE FIRST DAY IN NEW YORK.

THE children had taken such an interest in studying the geography of the country in and around their own State that Mr. Cartmell proposed one spring to take them on a longer trip. Mrs. Cartmell and Miss Gray agreed to join the party, provided they would be allowed to return home when they became tired out.

The trip from Boston to New York over the Boston and Albany road via Worcester and Springfield, in Massachusetts, and Hartford and New Haven, in Connecticut, was void of any special feature. Mr. Cartmell interested the children by telling them about the United States arsenal at Springfield, and Miss Gray repeated a portion of Longfellow's beautiful poem beginning —

> "This is the Arsenal. From floor to ceiling,
> Like a huge organ, rise the burnished arms;
> But from their silent pipes no anthems pealing
> Startle the villages with strange alarms."

At Hartford they caught a glimpse of the finely proportioned State capitol. As they rode through Connecticut Mr. Cartmell told them about the varied manufacturing interests in that State, such as hardware, firearms, clocks, watches, springs, hosiery, paper, cotton and woollen goods.

"What is New Haven noted for, George?"

"Yale College is located there."

Their train left them in the great **metropolis** at the Grand Central Station on Forty-Second Street. Comfortable quarters were secured at the Fifth Avenue Hotel, Madison Square. This is where Broadway crosses Fifth Avenue, and it is very centrally located for visitors. Madison Square is the place where processions are frequently reviewed by the mayor; it is a great public assem-

BROOKLYN BRIDGE, END VIEW.

bly-ground for the people.

After dinner the party took a short walk through the square and the streets in the vicinity; but they soon returned to the hotel and consulted their guide-books and formed plans for a good day's work on the morrow.

The boys were out before breakfast the next day, and went down Broadway to Union Square, where they found a pretty park of about four acres, with

TRIBUNE BUILDING.

CITY HALL PARK.

lawns, shrubbery, and trees. It contains statues of Washington, Lafayette, and Lincoln. George and Fred found on one side of the square Tiffany's well-known jewelry store, of which they had heard their mother and Miss Gray speak the evening before.

After breakfast Mr. Cartmell and his family began their tour of the city. They first rode up and down Fifth Avenue, where reside many of the wealthy men of New York.

"Are the houses all alike?" inquired Florence.

"Very much alike on the outside, at any given part of the avenue," replied her father. "Near Madison Square, you notice, they are built of brick with brownstone facings; where we are now, the uniform rows are of elaborate brownstone fronts with imposing porticos; opposite the Park we shall find that a variety of material is used, thus breaking the uniformity."

The driver pointed out the costly homes of the Astors and Vanderbilts. One of the Vanderbilt residences is seen at the left in the picture of Fifth Avenue. The Stewart Palace of white marble, which cost six million dollars, is now a club house. They were also shown where the rich New York social, literary, and political clubs meet, at different places on this avenue. There are several churches on the avenue, the most impressive being St. Patrick's Cathedral, built of white marble.

From this magnificent avenue Mr. Cartmell drove down town to the business portion of the city. The centre of this activity is perhaps the City Hall.

After luncheon at the Astor House, near City Hall Square, the party walked to the corner of Broadway and Park Row, and stood there in front of the post-office to watch the enormous stream of traffic pour into lower Broadway. Looking back they wondered how they reached the place alive, for the policemen seemed almost powerless to regulate the crowds of people, wagons, and street cars, so as to prevent a horrible jam. Opposite the post-office, which is a grand building, stand the sombre church of St. Paul and the white marble building of the New York Herald.

Going around the City Hall Park to the right, the Cartmells soon passed other great newspaper buildings, as those

of the Times, Tribune, and World. The clock-tower on the Tribune building is two hundred and eighty-five feet above the pavement. The World building is still higher, the editorial rooms being in the fourteenth story. All were surprised at the smallness of the City Hall, which

BROADWAY.

contains the office of the mayor and the meeting-place for the aldermen of so vast a city as New York.

After walking through City Hall Park, Park Row, and Printing House Square, and watching the thousands of people who constantly pour into the city from the terminus of the Brooklyn Bridge, seen in the picture just beyond the Tribune building,[1] Mr. Cartmell invited his family to rest themselves by riding for a while. They

[1] Page 155.

drove down Broadway towards the southern end of Manhattan Island.

On each side of the great thoroughfare they saw huge buildings filled with offices rising skyward. The Equitable Life Insurance building and the Western Union building seemed the highest. But above them all rose the spire of Trinity Church, calmly and peacefully looking down upon the strife and confusion of Broadway and Wall street as if honor and wealth were, after all, of no great value in this world.

From Broadway they turned into Liberty Street to see the business in a small side street. (See page 152.)

NEW YORK HARBOR FROM THE BATTERY.

This little street was found to be full of wholesale firms, who do a considerable part of their business in the street and on the sidewalk; even the carts and wagons are left in this and other streets over night, and although some good people complain, the evil remains.

The Battery was soon reached, and all alighted to stroll about under the trees, and sit upon the benches, and view the never-ending passing of all kinds of water-craft in the harbor. To the right they saw the statue of Liberty on Bedloe's Island; to the left the little round yellow Castle William on Governor's Island, where is stationed a part of the United States army, and between these points the distant outline of Long Island and Staten Island. They saw vessels constantly passing between these islands, and disappearing as they sailed into the lower bay, and passed by Sandy Hook out to sea.

The white walls and red sheds of the barge office of the New York Custom House rose before them to the east, and farther away, in the same direction, the Produce Exchange, with its lofty square tower and great hall. To the west they saw, near where they were sitting, the flat roof of Castle Garden, where millions of immigrants have landed during the past fifty years. The building is now used for other purposes, and the immigrants land on Ellis Island.

"Why is this place called the Battery?" Nellie asked.

"It was so named because an old fort stood here years ago."

Mrs. Cartmell and Miss Gray were now anxious to return to their hotel and rest a little before dinner.

After dinner Mr. Cartmell called the attention of the children to the part of the city, as shown on the map, which they had visited that day.

"You see we have been only through the lower part of the city. New York is built upon a long and narrow island, about thirteen miles in length and not much over two miles in width.[1] The city now extends beyond the

[1] See map, page 178.

Harlem River, the northern boundary of the island. The Hudson, or North, River washes the western side, and the East River separates the city from Brooklyn on the east, and connects the harbor with Long Island Sound. The great harbor, the converging rivers, the deep water, so completely land-locked, all combine to make the perfection of a seaport. New York is said to have over fifty miles of shore-line useful for shipping. The city has grown so rapidly in population that whole streets are quickly being built up and settled in the northern part. A million and a half of people live within the limits of the city, and as many more outside, thus making this metropolis the chief city of this country and the second largest in the world."

"Miss Gray," Nellie asked, "will you not repeat some poetry about New York City? I like poetry better than figures."

"Mr. R. H. Stoddard has written a number of poems about this city. One of them is called 'The Ferry-Boat.' A part of it runs like this": —

"I stood on the deck of the ferry-boat,
As the summer evening deepened to night;
Where the tides of the river ran darkling past,
Through lengthening pillars of crinkled light.

"The wind blew over the land and the waves
With its salt sea-breath, and a spicy balm,
And it seemed to cool my throbbing brain,
And lend my spirit its gusty calm.

"The forests of masts, the dark-hulled ships,
The twinkling lights, and the sea of men, —
I read the riddle of each and all,
And I knew their inner meaning then."

LESSON XVIII.

THE SECOND DAY IN NEW YORK.

"TO-DAY," said Mr. Cartmell at the breakfast table, "we will travel as far as we can on the *elevated railroads*, in order to learn by experience how they compare with surface roads."

"Where are you going first, Papa?" Florence asked.

"I think it will be quite pleasant in the **Park** this forenoon."

All were pleased with the idea of visiting a place they had heard so much about. They went to Central Park on the Sixth Avenue elevated road. Their train was reached by ascending a long flight of iron steps to the elevated station, where they purchased five-cent tickets, and patiently waited till the next train appeared, which was in a very short time. The cars on all these elevated roads are very comfortable, but in the morning going down town and at night in coming back are very much crowded. As they were going up town so early in the day there was plenty of room. The train, high up in the air, rushed past the upper windows of the houses, and quite near them, so they could see the people at work washing dishes, making beds, or otherwise engaged in labor. Looking down from the cars they could see below them the busy life of the streets. In a few moments they were at the entrance to the Park.

CHILDREN'S PROMENADE.

CENTRAL PARK.

ELEVATED RAILROAD.

METROPOLITAN MUSEUM OF ART, NEW YORK.

Here they engaged a carriage to carry them through the Park. As they rode along, Miss Gray told the children how the city engineers had to cut out the rocks for lakes, plant trees, build bridges and roads, walks and pleasure grounds, so as to overcome the unattractive features of the original surface, and turn a city dumping-ground into one of America's best parks.

They first rode to the Mall, where in warm weather many gather to listen to the music. Near by they saw the spacious ball-grounds, the great fountain, well-formed terraces, the concert-ground, and shaded gallery.

The boys and girls were greatly pleased with the children's promenade, the goat teams, aviary, and menagerie.

Beyond this delightful region the road wound past statues and beauties of landscape and garden till it came out beside the smaller reservoir, where stands Cleopatra's Needle and the Museum of Art.

To Nellie's question, "Where did this big stone post come from?" Miss Gray replied,—

"The Egyptians made it in one piece fifteen hundred years before Christ; they set it up in front of one of their temples. After standing there for a long time it was moved to Alexandria. Then finally the Khedive of Egypt gave it to the United States; it was put on board a steamer and brought to New York, and after great difficulty transported from the wharf to this spot and set up. The bill of one hundred and fifty thousand dollars for expense of moving Mr. Vanderbilt cheerfully paid."

They all spent over an hour in hastily glancing at the fine collections of paintings, statuary, vases, terra-cotta, old laces, and rare fabrics to be found in the different rooms in the Metropolitan Museum. The building is made of red brick with granite trimmings, and is well planned for its purpose. This collection is quite different from the one the boys showed to their cousin Albert in Boston, and as it was new to them they enjoyed the visit as much as any one in the party.

After coming out of the Museum the driver was directed to take them to the Sixth Avenue elevated road on Seventy-Second Street. Here they took a train for the Harlem River on One Hundred and Fifty-Fifth Street, and Mr. Cartmell showed them the new and elevated part of the city. From the high ground in this vicinity they obtained

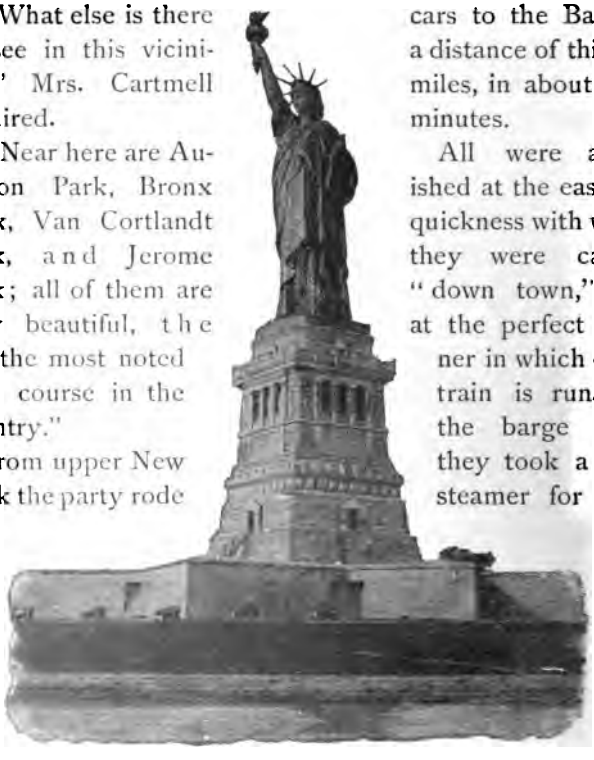
fine views of High Bridge, which carries the Croton Aqueduct over the Harlem River and Morrisania, a large suburb of New York.

"What else is there to see in this vicinity?" Mrs. Cartmell inquired.

"Near here are Audubon Park, Bronx Park, Van Cortlandt Park, and Jerome Park; all of them are very beautiful, the last the most noted race course in the country."

From upper New York the party rode on the Sixth Avenue cars to the Battery, a distance of thirteen miles, in about forty minutes.

All were astonished at the ease and quickness with which they were carried "down town," and at the perfect manner in which every train is run. At the barge office they took a little steamer for Bedloe's Island, that they might make a closer inspection of the great **French Statue**.



BARTHOLDI'S STATUE.

This name Mr. Cartmell used several times.

"Why do you call it a French Statue?" Fred inquired.

"Because a French sculptor by the name of Bartholdi

BROADWAY, TRINITY CHURCH, AND THE HARBOR.

made it, and the French people gave it to the people of the United States as an expression of their affection."

From their visit they learned that the pedestal is about one hundred and fifty feet high, and the statue itself

the same height, so the uplifted torch is over three hundred feet in height, which is higher than Trinity Church. The statue is a colossal bronze female figure bearing a torch, and is entitled, "Liberty Enlightening the World."

After returning to the city Mr. Cartmell invited his family to ride in an elevator to the top of a high building on lower Broadway, from which they obtained a splendid view of Bedloe's Island and the shipping in the harbor and the great buildings around Trinity Church.

Looking in another direction they saw the graceful curves of the great suspension bridge which unites two cities into one.

"Where next, Papa?" inquired Nellie, who looked rather tired.

"To the **bridge!**" exclaimed the boys.

"Yes, we will go there next," said their father.

When they reached the bridge it was nearly five o'clock, and they were astonished at the great rush of people going toward Brooklyn. Trains of cars filled and departed every half minute; hurrying men and women, the young and the old, the strong and the weak, jostled and crowded one another as they hastened homeward from the day's work or shopping in the city; hundreds of vehicles crowded the side avenues and pushed on towards the other city.

"The rush over the London Bridge," said Mr. Cartmell, "is not any greater than what we have just seen. Let us cross and see more of it."

They attempted to get on board the next train, but were crowded out by those who stood nearer the doors. Watching how others did, they stood as near the track as possible, and when the next train backed up they sprang

through the door in double quick time, to find every seat taken by those who were quicker, and the car filled and moving away in less than a minute.

The Cartmells were soon on the Brooklyn side, and walked back so they could better study the structure of the bridge.

"This bridge," said their father, "is larger and more important than the Victoria bridge at Montreal, the canti-

BROOKLYN BRIDGE.

lever bridge at Niagara Falls, the iron bridge at St. Louis which spans the broad Mississippi, or even the famous London bridge across the Thames."

As the Cartmells walked along they noticed that the eighty-five feet of the width was divided into five parallel avenues, averaging sixteen feet in width. The centre one is

elevated twelve feet above the others for a footway; it thus gives the passers a fine view of the river and the two cities made one by this marvellously suspended street. The outside avenues are devoted to vehicles, and the other two are used by the cable cars.

When the centre of the bridge was reached, Mr. Cartmell stopped and asked them to look down to the water below.

"The bridge," said their father, "is here one hundred and thirty-five feet above high-water mark; and it is nearly eight hundred feet to either tower, or sixteen hundred feet between the towers. These two towers are two hundred and seventy-six feet high. The bridge with its approaches is over a mile long.

"Notice these four great cables on which the bridge rests. They are not fastened to the top of the towers, but pass over them and are anchored in the ground a thousand feet away, and held firmly in place by sixty thousand tons of stone masonry."

"Of what are these cables made?"

"They are made of wire one eighth of an inch in thickness, numbering five thousand wires in each cable. This makes a bundle sixteen inches in thickness and containing over three thousand miles of wire.

"Notice, boys, how firm the bridge is at this time with all this traffic, and a good breeze blowing. This firmness is secured by means of parallel trusses and stays of steel wire ropes."

Going home George asked, "Who built the bridge?"

"The bridge was begun by Mr. Roebling, senior, in January, 1870. The father soon died, and the work was carried on by his son. Young Roebling soon contracted a painful disease which prevented him from leaving his room

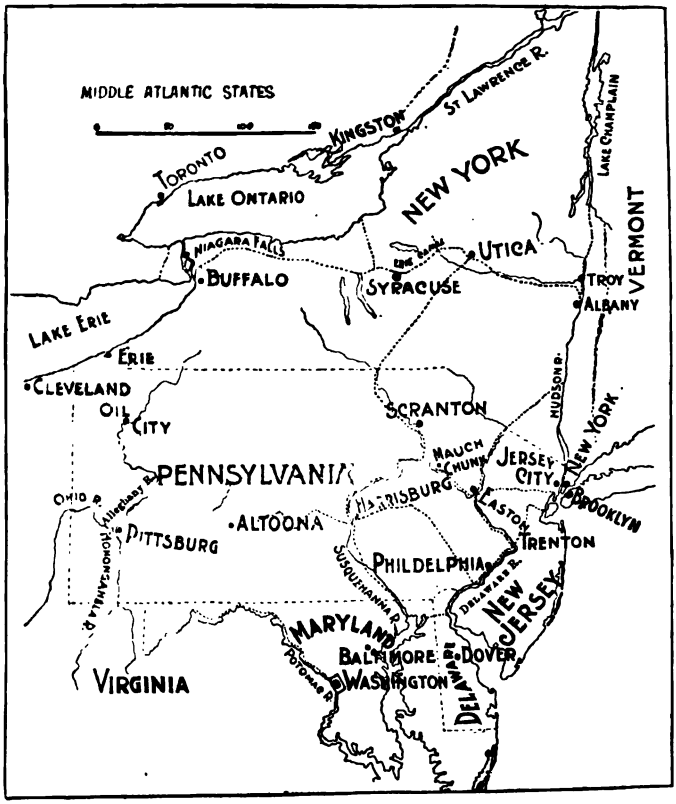
during severe weather; but he moved into a house in sight of the structure, and from his sick chamber by means of telescopes and the help of his faithful wife he carefully oversaw every detail of the great structure. The bridge was finished in 1883, about fourteen years after it was begun. A small army of six hundred men worked upon it, over twenty of whom were fatally injured.

"What the Pyramids are to Cairo, St. Peter's to Rome, the Kremlin to Moscow, the Capitol to Washington, this beautiful suspension bridge is to New York and Brooklyn, — the first and last thing to see, something both useful and beautiful."

THE HUDSON RIVER.

ROLL on! roll on,
Thou river of the North! Tell thou to all
The isles, tell thou to all the continents,
The grandeur of my land. Speak of its vales,
Where Independence wears a pastoral wreath
Amid the holy quiet of his flock,
And of its mountains with their cloudy beards
Tossed by the breath of centuries; and speak
Of its tall cataracts that roll their bars
Among the choral of its midnight storms;
And of its rivers lingering through the plains,
So long, that they seem made to measure Time;
And of its lakes that mock the haughty sea.

WILLIAM WALLACE.



MAP OF THE MIDDLE STATES.

LESSON XIX.

OUR FOREIGN COMMERCE.

THE young people in their travels about New York were deeply impressed with the great amount of business which is constantly carried on in that city. Every time they went out they found the streets crowded with human beings, and with all kinds of traffic. The roar of never ceasing travel was heard till late at night, and early in the morning the same din came to their ears when first they awoke.

In their frequent rides across the Hudson on the ferry-boats, or over the East River, they noticed how crowded the harbor was with all kinds of shipping. Quite frequently they saw freight and passenger cars carried on great flat-bottomed boats over the water from railroad to railroad.

One day father and sons paid a visit between Canal and Twenty-Fourth Street, to the piers along the Hudson River, where the **foreign steamers** and **vessels** are anchored. They visited here and on the Jersey side the piers of the White Star, Cunard, Inman, Guion, German, and French lines. They saw several of the great ocean racers, — one, the Teutonic, cost two million dollars, and recently crossed the Atlantic in five days and sixteen and a half hours, moving at the rate of about five hundred miles in a day, or as fast as many so-called express trains.

Many of these great steamers are six hundred feet in length, and each carries over twelve hundred passengers and twenty-five hundred tons of freight. They consume

about three hundred tons of coal in twenty-four hours. As soon as they reach their docks, barges containing the coal are towed alongside, and the work of coaling commences.

Mr. Cartmell found that one of the "ocean greyhounds" was to sail that day, so he took the boys to see the sight. They found the ship and landing thronged with passengers and their friends who had come to bring flowers and say good-by. A long line of trucks loaded with all sorts of merchandise was moving slowly down the pier and delivering its packages opposite the particular hatchway intended for such goods. Steam-hoisting apparatus was in rapid motion at each hatchway. Different gangs of stevedores were rushing up and down the gang-planks, bearing trunks and boxes of every description.

After watching the animated scene for half an hour the party followed the throng on board the floating palace. They found that the ship was supplied with every luxury money could command and brains devise. In a large, commodious saloon, or dining-room, the tables were being arranged for the first meal at sea. Meals are served four times a day during the voyage. Besides the grand saloon there are other elegant saloons, library, and retiring rooms, all lighted at night by electricity. The cabins are superbly furnished, and the passengers are waited upon by servants of long training.

The party saw the mail put on board in a special room by itself. One thousand bags were received that day. In some steamers the mail is sorted while being carried across, thus saving considerable time. One week the mail was made up in New York on Wednesday, placed on board a fast steamer, and delivered in London on the following Wednesday.

NEW YORK HARBOR.

"This steamer," said Mr. Cartmell, "has probably a special room in some out-of-the-way place, constructed of steel plates riveted together and provided with a heavy door of steel. In it are placed the gold and silver bars and coin in bags which are constantly shipped from New York to London and back again, to meet the requirements of trade. Sometimes this room has intrusted to its safe keeping over four million dollars."

There are fast freight steamers which cross the Atlantic in ten or eleven days. The Wilson Line with its thirty steamers is one of the greatest freight carriers in the world. The Hamburg-American has nineteen steamers.

There are forty-three other lines not mentioned here which do business from New York. Besides these regular lines one hundred and thirty-six "tramp steamers" entered New York harbor in 1891. These tramps come in ballast and wait for orders. At another pier they found a large English steamer being loaded with wheat in bulk from a floating elevator at her side. The grain is pumped from the great pens of the elevator into the hold of the ship. The elevator received the grain from the canal-boats, which have passed from the Great Lakes through the Erie Canal and been towed twenty at a time down the Hudson River.

The boys found a strange looking steamer at one pier whose funnel was forward of the mizzen-mast. She proved to be a tank steamer, whose hold is divided into seven or eight tanks for oil; each tank holds about four thousand barrels. The tanks are filled by means of a powerful pump. They saw a Norwegian steamer unloading a cargo of green bananas from Jamaica. The head stevedore informed Mr. Cartmell that he had taken out twenty thousand bunches,

and there were five thousand more to remove. Some of the bunches weigh two hundred pounds. The average weight is eighty pounds.

There are ninety steamers carrying fruit from the West Indies and Central America to the United States. The hull of these steamers is of steel lined with wood; the space between the steel plates and the wood is filled with charcoal, which makes the ship a floating refrigerator. These fruit steamers have three decks, all open in such a way as to secure a good circulation of air to prevent the fruit from decaying.

Before going home, Mr. Cartmell went over to Jersey City with the boys to see them load a steamer with cattle. The cattle were driven up a narrow gang-plank and put in strongly-made pens between decks. The pens hold half a dozen each, and the space for each head of cattle is fixed by law at two feet six inches by eight feet. By placing them close together they keep one another in position when a heavy sea is encountered. George and Fred thought the cowboys who drove them were quite cruel, but some of the cattle were greatly frightened and behaved badly. One steer became so excited and maddened by the smart blows rained upon him that he jumped from the plank into the water. Quick as thought a sailor jumped in after him and passed a rope around the animal, and those on the ship hoisted him on board by means of a block and tackle. A thousand head of cattle are sometimes carried across in one steamer.

When the boys returned, they told their sisters about the wonderful sights which had been seen. This led to an evening's talk about the **foreign commerce** of this country.

Nellie was allowed to speak first, and she said, —

"I have just been reading a description of the harbor which I think does justice to its crowded condition. I would like to read it: —

"'On the blue waters ride ships from every large European port, — sloops, schooners, and square-rigged vessels from far and near; harbor barges, great excursion boats, and Sound steamers with their pointed prows, double or triple tiers of decks, and immense side wheels; bulky, low ferry-boats; trim yachts, with their snow-white sails and yellow masts; black-hulled, black-rigged government vessels, with puffing little tugs steaming about from one point to another, — sometimes darting away like a messenger in hot haste, sometimes laboriously dragging a trail of four or five heavily laden scows or train-boats, or towing a disabled vessel to port.'"

"That is a good description," said George, "of the business of the harbor, if you add a word about the coming and departing of the great ocean steamers."

"New York," said Mr. Cartmell, "is not only the largest city in the Western world in population, but it is the largest seaport; it also stands next to Liverpool and London in commercial importance."

"Is not nearly all the commerce of the world," George asked, "carried on by Europe and the United States?"

"Yes. If we arrange the great commercial countries according to amount of shipping, the countries will appear in the following order: —

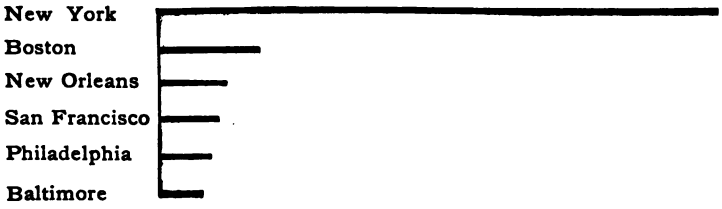
"GREAT BRITAIN,
UNITED STATES,
NORWAY,
GERMANY,
FRANCE,
ITALY."

"How does New York compare with Boston, Philadelphia, and other cities in reference to commerce?"

"New York stands far ahead of the other cities commercially. Over fifty per cent of the trade of the country passes in and out of this harbor. Sixty-seven per cent of all the tariff duties are collected here.

"About six thousand vessels engaged in foreign trade entered and cleared from New York in 1890. Nearly half of these ships were British. About one fifth of all the vessels registered in the United States are owned in New York.

"If we compare the six leading cities of the country commercially in reference to *imports* and *exports*, according to recent statistics furnished by the government, they stand in the following order: —



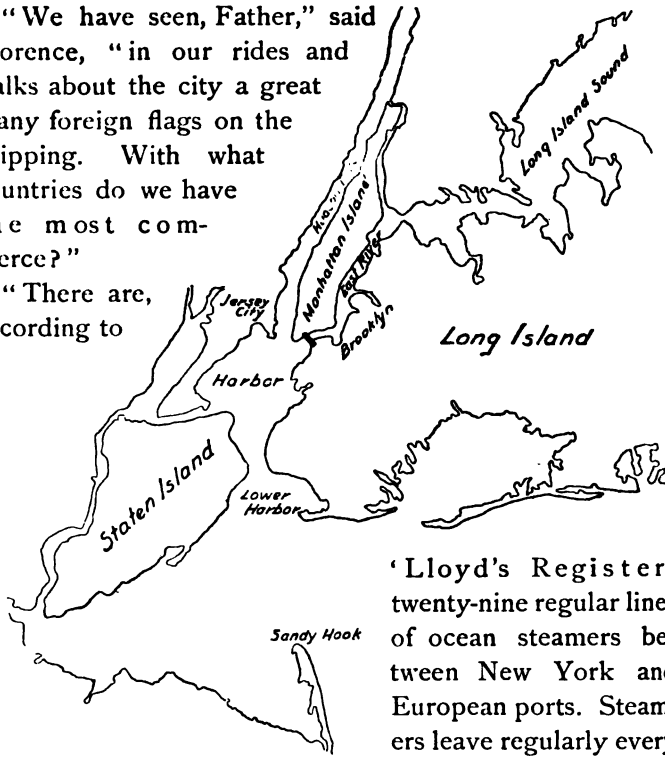
"Why is New York so much larger than the other cities, Papa?"

"Because, my son, it is well situated for commercial prosperity. It is located about in the centre of the Atlantic coast; it has a fine harbor, with plenty of wharf room. There is abundant room in the harbor where ships can anchor safe from storms. The Hudson River and Erie Canal connect this city directly with a rich agricultural section, and with the more distant great lakes, and the great grain regions of the West. The railroads connect this metropolis with every great city in every part of the

country. By studying the local map of New York and vicinity you see at a glance some of the advantages I refer to."

"We have seen, Father," said Florence, "in our rides and walks about the city a great many foreign flags on the shipping. With what countries do we have the most commerce?"

"There are, according to 'Lloyd's Register,' twenty-nine regular lines of ocean steamers between New York and European ports. Steamers leave regularly every day in the week, except Sunday, for Europe. The principal lines run from New York to Liverpool, Glasgow, London, Bristol, Hull, Newcastle, Hamburg, Havre, Bremen, Antwerp, and several ports in the Mediterranean in Europe; to Norfolk, Richmond, Charleston, Savannah, Fernandina, and New Orleans in the Southern

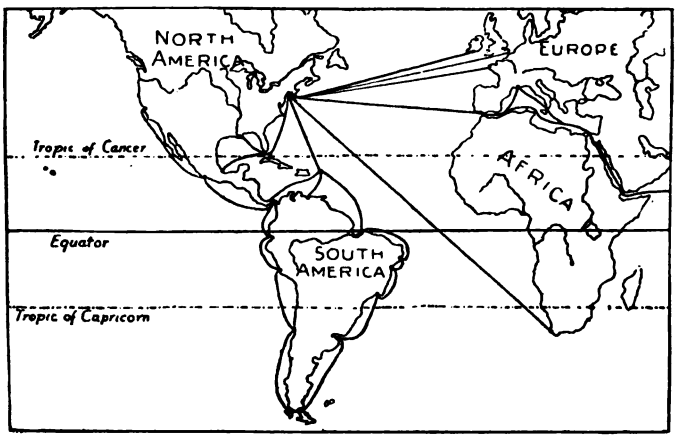


NEW YORK AND VICINITY.

States; to Portland, St. John's, and Halifax in the Northeast; to Havana, Hayti, Jamaica, St. Thomas, and other places in the West Indies; and to Aspinwall, La Guayra, Rio Janeiro, and other ports in South America.

"Less than one fourth of this trade is carried in ships flying the stars and stripes. This is not very creditable to the people of the United States.

"There is one line of steamships from New York to ports in India, China, and Japan by way of the Mediterranean Sea and Suez Canal. This line carries out kerosene oil in cases as its principal freight."



ROUTES OF COMMERCE.

Mr. Cartmell, with some help from George, made a commercial map to show the great routes of travel from New York.

"With what country do we have the most trade?" George asked his father.

"More than half of the *exports* of the country are sent

to Great Britain; then come in order Germany, France, Canada, West Indies, Belgium, and Italy. One fourth of the *imports* come to this country from Great Britain; then come in order the West Indies, Germany, France, Brazil, and Mexico."

"It must require a good many men to handle the goods received and sent away from this port."

"Yes. Thousands of men are employed as sailors, as stevedores, as truckmen, as brakemen and engineers, as clerks, captains, and overseers, as Custom-House officers, for loading and unloading, making out bills of lading, collecting the customs, etc.

"You realize what an enormous amount of articles are moved in this seaport when you are told in the last report of the Chamber of Commerce that New York received in one year 1,360,000,000 pounds of sugar, 12,000,000 gallons of molasses, 360,000,000 pounds of coffee, 81,000,000 pounds of tea, and $150,000,000 worth of cotton and woollen fabrics. There were sent out in vessels to other countries 600,000,000 gallons of refined petroleum, and 1,000,000 bales of cotton, the latter worth over $50,000,000. An immense amount in value of bacon, lard, flour, corn, tobacco, beef, wheat, cotton cloth, cheese, and machinery is shipped every year."

LESSON XX.

MEANS OF RAPID COMMUNICATION.

"HAVE we not all noticed," Mr. Cartmell asked one evening, not long after the events related in the last chapter, "that in this city everything is done quickly? Time is a matter of great importance both in business and in life. The people have a new motto, which is, 'Everything that is worth doing is worth doing quickly.' In all the places of business you see the type writer and shorthand-writer. Letters must be written at full speed, after they are dictated, and sent off in a hurry to the person to whom they are addressed."

"Does not New York do a heavy post-office business?"

"New York handles more mail matter than any other post-office in the country, and the profits are here the greatest for the Government. It takes seventeen hundred men to collect, sort, and deliver each day the two million letters, newspapers, and packages which are here brought together and distributed. Besides the central station, which we saw the first day of our visit, there are seventeen sub-stations, most of them named by a letter of the alphabet.

"The carriers make in the business part of the city hourly deliveries and collections during week-days. There is scarcely any point of importance in the country for which a mail is not made up at least twice a day; foreign mails are despatched by every steamer.

"In order that letters may be sent the more rapidly, the mail cars go with the fast trains, and the letters are sorted in the cars as the train moves. By paying ten cents extra letters are delivered now by special delivery."

"What is the present rate of postage, Papa?"

"It is on letters two cents for each ounce or fraction of an ounce; on books, circulars, newspapers, and pamphlets one cent for every two ounces.

"Long ago, however, people became dissatisfied with the slow movements of letters through the mail, and began to devise some more rapid method of communication; and so the **telegraph** was patiently thought out, and is now in general use all over the world."

"Now please explain to us about the telegraph."

TELEGRAPHING.

"The word *telegraph* means to write at the end, or far away. It is a system of sending messages by the use of electricity; and yet nothing like a letter or sentence is sent over the wires, — nothing except a wave, or pulsation."

"Do tell us more about it," exclaimed Nellie.

"I will draw a little illustration to help you understand the matter. Suppose New York and Philadelphia are united by copper or iron wire, as represented in this drawing. The ends of the wires run down into the earth, and

thus a circuit is formed, over which the electricity readily passes. This circuit can be broken at New York by raising or depressing the lever at *C*. When the lever is pressed down the circuit is closed, and the electricity passes from the battery cells below *C* in New York over the wire and into the ground at Philadelphia.

"In doing so the electricity changes *b* into a magnet, and it attracts the lever *H* towards itself at *Z*; this causes the

A	B	C	D	E	F
G	H	I	J	K	L
M	N	O	P	Q	R
S	T	U	V	W	X
Y	Z	&	,	?	.

TELEGRAPHIC ALPHABET.

pin near *g* at the end of the lever to press upon the ribbon of paper which passes over the roller at *a*. If the person in New York presses down the lever for some time, the pin at the other end will make a long mark, like this ——; if he presses a shorter time and then raises his lever and again depresses it, he will make at the other end two dashes like these -- —; if again he presses down several times quickly, the dashes will become dots, like these - - - - - -; for the spring at *g* raises the lever whenever *b* does not act as a magnet."

"I suppose those signs could stand for letters or words," remarked George.

"Mr. Morse, who is usually called the 'father of the telegraph,' invented an alphabet which I will show you,

and which with some improvements is still used. In large offices they receive now by sound instead of by sight, the same alphabet being used.

"The lever used for opening and shutting the circuit is called a *key*. A simple form of it is shown in this picture.

KEY.

"The instrument for making the dots and dashes, called a *receiver*, is shown in the picture which you can see in this book on telegraphy. It works in exactly the same way as I described above.

"It has been well said that the telegraph system has become to the world's inhabitants what the nerve system is to the human body. If it should be destroyed, the commerce of the world would suffer seriously, and perhaps be reduced one half. The financial transactions of the world are now largely transacted through the telephone, telegraph, and cable. Great fortunes made by one man in a few years are only possible in a land and in a time of electricity and telegraphs. Even steam is too slow for this work of speculation."

MORSE RECEIVER.

"Please tell us something more about the telegraph business, Father."

"The total length in miles of the wires now in use for telegraph business in the world is one million six hundred thousand. Over these wires are sent each year one hundred and forty million messages. In addition, there are of submarine cables one hundred and fifteen thousand miles,

conveying across the deep seas and around the world millions of messages a year. The length of lines in use in the United States is two hundred and fifty thousand miles, three times as much as in any other country in the world.

"In England the business is now carried on by the post-office department; in the United States most of the work is done by one company, called the Western Union Telegraph Company, which employs about twenty-five thousand operators and controls over half a million miles of wire. It has sixteen thousand offices, and sends annually over eighty million messages, besides the newspaper business and messages sent for railroads. More messages are sent to each one hundred inhabitants in the United States than in any other country except England.

"The amount of telegraph business in one central city like New York is enormous. Every day from the main building of the Western Union there are sent out to every part of the world an average of three million words, while as many more are received. To do this work requires two thousand persons in that city alone. One half of these words is copy for the newspapers. Besides the main office there are two hundred branch offices throughout the city."

"Are boys employed in New York telegraph offices?" Fred asked.

"Yes. Young boys are usually employed to deliver the messages here, as in Boston, and they are called *messengers*. They are frequently paid at a certain rate per message delivered. Messages are delivered without charge in the vicinity of the office. In case the distance is considerable the cost of horse-car fare is usually added. These boys are required to be promptly on hand during the

hours of service. Some work in the day time, and some in the evening and night."

"There is," added Miss Gray, "another important use of the telegraph. It is used to a great extent in this and other countries in connection with the running of trains on single-line roads.

"The man who attends to this business is called the *train despatcher.* He sits beside the telegraph operator and checks off train and station as arrivals are telegraphed. He quickly gives his orders to the operator to send trains along or to hold them, as the case requires. He decides where trains running on the same division in opposite directions will pass each other."

"Can they not send messages to Europe now?" George asked.

"Yes, we have been able to do this for several years. The first Atlantic cable which worked successfully for any length of time was laid in 1866. Each of the Atlantic cables is a one-wire conductor, four to six wires wound around a central wire, and all acting as a single conductor. These conducting wires are *insulated,* or separated from other matter capable of carrying electricity, by several layers of gutta percha, or rubber. For protection from water and force the whole is surrounded by an armor made of several strands of iron wire enclosed in manilla hemp. Most of the cables are about one inch in diameter.

ATLANTIC CABLE.

"Eleven ocean cables now stretch across the North Atlantic, and yet they are not capable of doing the increasing business between the Old World and the New, and other lines are being built. Each of these cables is about

three thousand miles long. The longest cable runs at the bottom of the Atlantic ocean from Lisbon, Portugal, to Pernambuco, Brazil, a distance of 3,333 miles.

"Two cables connect Florida with Cuba, and one runs from Cuba to Aspinwall, on the Isthmus, and another to Rio Janeiro. North America is directly connected with South America by a cable running from Mexico to Valparaiso, Chili."

"Does not the telegraph have a modern rival in rapid communication?" Mrs. Cartmell inquired.

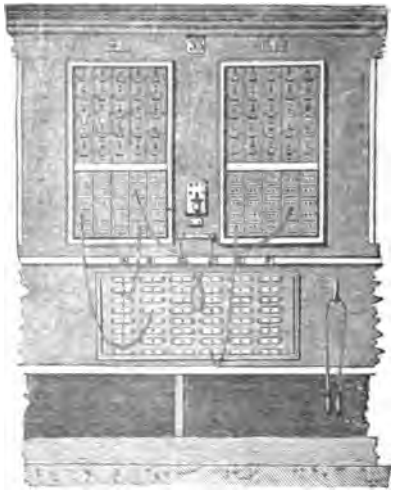
"I presume you refer to the **telephone**, by which we can speak to a person a long way off. This is said to have been invented by Prof. A. Graham Bell, in 1866. It consists of three parts, the *transmitter*, the *wire*, and the *receiver*.

TELEPHONE.

"These are shown in this picture. In the upper part of the picture you see the electric bells which ring when a person turns the crank and generates a current of electricity. Not only these bells ring, but similar ones at the distant office, which thus call up the person who is needed. The person who wishes to talk with the distant friend then takes from the hook the receiver and places it to his ear. When the weight is removed from the hook, the hook rises a little and throws the receiver and transmitter and battery into circuit, and the bells out of circuit.

"The distant friend has done the same with his receiver, — that is, placed it to his ear; and then he calls 'Hello.' 'Who is there?' will be perhaps the reply, and then the

conversation goes on. When the friend speaks before the transmitter he causes a disk to vibrate; the vibrations of the disk near the speaker are reproduced by currents of electricity in the receiver held to the ear of the other party, and the vibrations become sound, or words."



CENTRAL OFFICE EXCHANGE—BOARD.

"What is meant by the 'Central Office,' Papa?"

"It is the telephone exchange for a large number of subscribers to the use of the telephone. Subscriber No. 6 wishes to talk with Subscriber No. 42, so he signals the central office by ringing a bell or dropping an indicator, and at the same time revealing his number. The person at the central office connects his telephone with the subscriber and asks 'What, sir?' 'I wish No. 42.' Central office rings up No. 42, and the two numbers are connected by a silk-covered wire, as shown in the picture; a signal is then sent to No. 6 and conversation begins. When the subscribers are through talking they signal the central office.

LESSON XXI.

A SUIT OF CLOTHES.

"Is there much manufacturing in this city, Papa?" Florence asked one evening.

"New York is one of the largest manufacturing cities in the world. There are over twelve thousand manufacturing establishments in different parts of the city, employing two hundred and fifty thousand hands, and paying them over one hundred million dollars in wages every year. Over two hundred different kinds of work are carried on in these manufacturing places."

"What are some of the principal manufactures?"

"Printing and publishing employs ten thousand persons a year; but **clothing** is obliged to have six times as many hands to do its work, and leads the list. Other large manufactures are those of iron and steel, refined lard, malt liquors, sugar and molasses, pianos, millinery, lace goods, jewelry, furniture, furnishing goods, and boots and shoes."

"Please tell us," said George, "how the suit of clothes you bought for me yesterday was made."

"The clothes we wear," said Miss Gray, "are made of three substances, — cotton or linen, which are vegetable, or wool, which is animal, and is the warm covering given to sheep to keep them warm in cold weather."

"The world," said Mr. Cartmell, "is supposed to contain about half a billion sheep. Less than fifty million, or

less than one-tenth, are kept in the United States. The rest are mostly distributed in Great Britain, Europe, Australia, and the Argentine Republic. The best breed of sheep for wool is the Merino, imported into other countries from Spain. Two thirds of the sheep in this country are east of the Mississippi, and there are few flocks in the East containing over a thousand apiece.

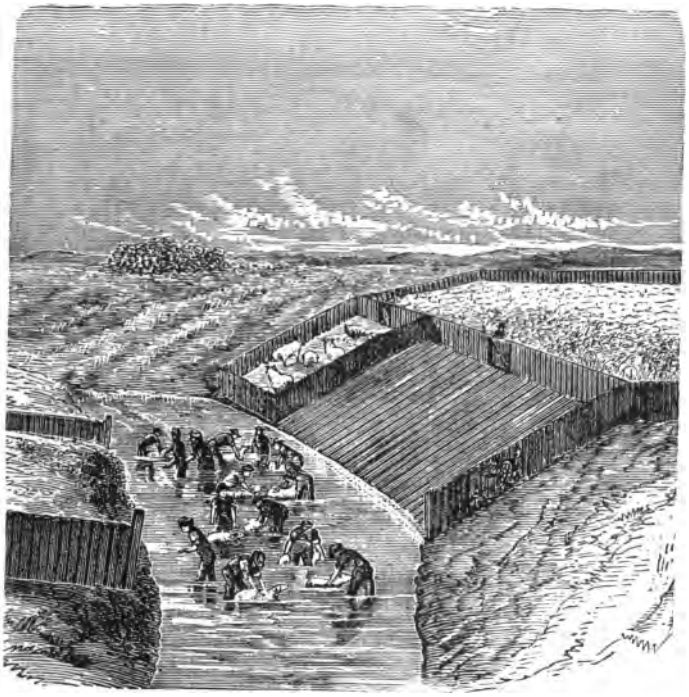
SOUTHDOWNS.

"Wherever sheep are raised, sheep-shearing is one of the farm festivals, and occurs from April to June. The flock is first washed in a running stream, and given about ten days to become thoroughly dry. In California Indians are considered the best shearers. Peculiar spring shears are used, and a good workman will rarely cut the sheep, which are generally quite patient under the operation. The owner has to take great care after the huge overcoat is taken off that the animal does not take cold and die. The fleeces are baled and sent to market in Boston or London. Boston is the great wool market of the Western world."

"How is the wool made into cloth?"

"In a way similar to what you saw employed in Lowell, in making cotton cloth.

"When the bale is opened at the mill, the *sorter* separates the fleeces according to cleanliness, softness, length of fibre, etc. Then the wool must be washed in soapy water,

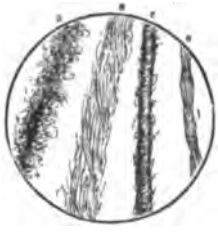


WASHING SHEEP.

squeezed, and dried. This process is called 'scouring,' and by it one third of the weight is lost. After this the wool is dyed. Logwood, fustic, indigo, and aniline dyes are principally used for coloring.

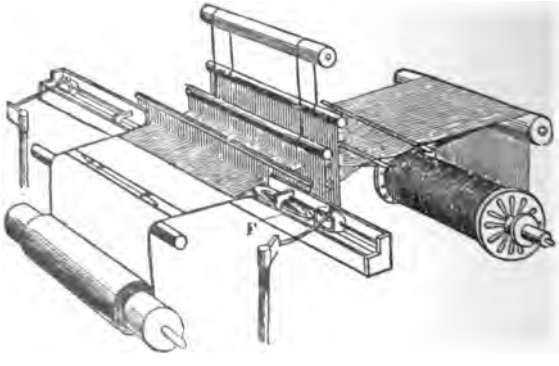
"The wool is then *carded*, pulled out straight, and afterwards spun, that is, drawn out and twisted into yarn, by large and costly machines. After this it is woven, in great power-looms, into plain cloth, serge, cassimere, diagonals, broadcloth, doeskin, flannel, or worsted goods,

according to the yarn used, and the interlacing or crossing of the threads and the manner of finishing the cloth. Massachusetts, Pennsylvania, and Rhode Island are States in which woollen goods are extensively made. In this city much of the cloth is made into suits. The operatives to-day are better paid than they were one hundred years ago, and the cloth they make costs less.



A. Woollen Yarn.
B. Worsted Yarn.
C. Cotton Thread.
D. Silk Thread

"The principal parts in the modern power-loom are shown in the cut below. One set of threads in the warp are raised, and at the same time the other threads are drawn down, leaving a space between, which is called the 'shed.' Through this shed the shuttle is thrown by a sling move-



IMPORTANT PARTS OF A LOOM.

ment. The shuttle carries the bobbin of yarn which makes the weft. It flies back and forth very rapidly.

The cloth as fast as it is woven is wound around the cylinder at the left.

"The cloth is woven very wide, and then 'fulled' or 'milled,'—that is, washed in warm soapsuds, and beaten with wooden mallets or subjected to great pressure, which makes it shrink and causes the threads to come much nearer together.

SHUTTLE.

"The next process is one of the most important; it is called 'teaseling.' When the cloth leaves the fulling room, its surface has a hairy appearance, caused by the ends of the wool sticking out. These loose parts must be further torn out so as to form the 'nap,' and for this purpose the cloth is curry-combed by drawing across its surface teasels.

A TEASEL.

"The teasel is the ripe fruit of a cone-bearing plant. It has hooked points bristling all over it, something like the prickles on the common thistle. These hooks all curve in the same direction. They are strong and elastic, and exactly fitted to *tease* out the threads from the surface of the woollen material.

"The teasel is split, and fastened to cylinders so as to present a uniform prickly surface. Over these spines the piece of cloth is drawn till it looks like the shaggy coat of a wild pony. Next the cloth is 'sheared,' or 'shaved,' to make the nap even and have a velvety appearance. Some of these operations are repeated with little variations."

"How is this cloth made into clothes, so you can buy a new suit, if needed, in almost any city or town?"

"As civilization advances, labor is more and more subdivided into special channels. The savage does everything for himself; the semi-civilized hires a few things done by others. My grandmother spun the wool and wove it into cloth, and made my grandfather a suit of clothes. But machinery and skilled labor have come in, and now do the work so much better and cheaper, that it would be foolish for your mother to make my clothes.

"The principal machine employed in making a suit of clothes is the sewing machine. This invention made possible ready-made clothing for men and women. Miss Gray, I think, will tell you the rest."

"To make all this cloth into ready-made suits requires an army of tailors, milliners, dressmakers, and seamstresses. A much greater number is needed than to make the cloth, for machinery cannot be used so fully.

"All articles of wearing apparel can now be purchased in every large city, so that bride and bridegroom can be supplied with complete outfits in half an hour's time.

"Clothing was once cut with ordinary shears, one pattern at a time. Now the leading houses prepare patterns for persons of different sizes; and the Fenno cutting wheel, a fine circular saw making two thousand revolutions a minute, enables one person to cut through several layers of cloth with astonishing rapidity. The clothes when cut are then distributed among many shops, families, and individual sewing women, to be made up at very low prices."

Mr. Cartmell then added: "Some of the ready-made clothing establishments in this city employ thousands of workers and do an immense business. One has a special train filled with measurers, which goes from station to station measuring the workers on the road for their uniforms."

LESSON XXII.

THE CAPITAL OF THE UNITED STATES.

AFTER a stay of two weeks in New York City the Cartmell family journeyed by the Pennsylvania Railroad southward to other great and noted cities. This railroad is often called the model railroad of the country. It has a school at Altoona where young men go to learn how to build, equip, and manage a railroad.

Leaving New York at eight o'clock in the morning, our friends were in two hours in Philadelphia, where a short stop was made to see Independence Hall and a few of the principal streets. In the afternoon they rode on to Baltimore, and from the Union Station took a drive through the main avenues of the city, and then on to **Washington**, which place was reached in the evening. Mr. Cartmell found good rooms at Willard's Hotel on Pennsylvania Avenue, corner of Fourteenth Street.

Congress was in session, and Washington was full of life and bustle.

The next day they drove down Pennsylvania Avenue to the **Capitol**. Before them all the way rose the great white dome of this imposing building to which they were going. The wide avenue was alive with carriages and cable cars and pedestrians. A better idea of the scene can be obtained from examining the pictures on pages 197 and 207 than from any lengthy description.

They were driven to the eastern entrance, and ascending the granite steps soon found themselves in the Rotunda, under the great dome. They first looked at the eight historical paintings on the circular wall forming the sides of the Rotunda, all by noted American artists. Then Mr. Cartmell called attention to the wonderful fresco decorating the canopy over their heads. This represents Washington with Freedom, Victory, and other figures.

George, Florence, and Fred were anxious to ascend to the dome and obtain the view. While they were gone the rest of the party visited the Hall of Statuary, which they found contained statues of prominent men in the different States. They spent a few moments in the great National Library, one of the five great libraries of the world. It contains a copy of every copyrighted book published in the country, and is so crowded that books are two deep on the shelves and lie in piles on the floor.

Meeting the children in the Rotunda, Mr. Cartmell led them to the north wing of the Capitol, where they found the Senate Chamber. Going into the gallery they obtained front seats, and gladly sat down to look about. They were in a large room, quite plainly furnished. The walls were painted in pleasing tints, decorated in gold, and have buff panels. On the floor mahogany desks and chairs were arranged in four semi-circles. Facing these desks, on a dais, was the chair of the President of the Senate; to his right a chair for the sergeant-at-arms, to his left, one for the assistant door-keeper. In front of the president's desk were the desks of the Senate clerks, and the tables of the official reporters. "Who sits above the president's chair in the gallery?" Fred asked.

"The reporters for the press," replied his father.

While they were looking at the different objects, the

SENATE CHAMBER.— PENNSYLVANIA AVENUE. — HALL OF THE HOUSE OF REPRESENTATIVES, WASHINGTON, D. C.

gallery began to fill up, a few Senators came in and talked in groups, and the reporters strayed into their seats.

Just as the hands of the clock pointed to 12 M. the Vice-President of the United States, who is the presiding officer of the Senate, entered from the door in the rear and took his seat. After calling the Senate to order, the chaplain offered a short prayer, and then the journal of the previous day's proceedings was read. This was followed by different Senators introducing numerous petitions and bills, which were at once referred to appropriate committees for consideration.

At one o'clock the president announced that the "morning hour" had expired, and the Senate began to discuss a certain bill which was next in order on the calendar.

"The Senate," said Mr. Cartmell, "is a very dignified body, and rarely shows much excitement in debate. Let us go now to the Hall of Representatives."

The galleries here were nearly full, and they had some difficulty in getting good seats. A lively debate was evidently going on, and cries of "Mr. Speaker!" "Mr. Speaker!" were heard from different parts of the hall. A dozen men were ready to join in the discussion the moment they were recognized. The Speaker kept striking his table with the gavel. As soon as it became quieter, he spoke the name of a representative from Pennsylvania, and this man began to speak.

The other members did n't seem to care to listen to him, and so they began to write letters, to read the papers, to talk and laugh in groups among themselves. Many went out into the halls and sat before the cheerful grate fires. As members clapped their hands in their seats, the pages quickly responded to the calls, and went in and out on

various errands. The member who was speaking did n't seem to mind all this noisy interruption, but spoke rapidly and fluently, well knowing that his speech would be taken down by the faithful reporters and published in the Congressional Record next morning.

As soon as he had finished there was another contest to catch the Speaker's eye and be recognized. This time a man was named who seemed to be popular, for the members came in from the anterooms, and respectful attention was given by all. In a few short, pungent, witty sentences which called forth peals of laughter he showed the absurdity of the position advanced by the former speaker, and then presented to the listening House his own views of the subject. Several times he was interrupted by members who desired to ask questions. He freely gave them permission, for he was ready with answers which showed his complete knowledge of the matter under consideration, and his long experience as a public debater.

After he finished speaking the House soon adjourned. Mr. Cartmell called the attention of his family to the fact that the Hall of Representatives is similar to the Senate Chamber in its arrangements, only it is much larger. It requires a man with good speaking qualities to be heard there. There are desks on the floor for three hundred and thirty-three members. The galleries will seat about fifteen hundred.

It was then nearly four o'clock, so the Cartmells paid a hasty visit to the basement to see the restaurants, document and folding rooms, after which they returned to their hotel for dinner.

LESSON XXIII.

OUR GOVERNMENT.

AFTER leaving the dining-room they all met in their private parlor, which overlooked Pennsylvania Avenue; but it was too late to see much from the windows except the many lights up and down the avenue.

While discussing the interesting sights they had seen in the Capitol, Fred asked his father to explain to them more fully about **Our Government.**

"I shall be happy to do that if Miss Gray and the others will help me. This is a very appropriate place and time for us to consider the subject, for this city is the seat of the United States Government, or as it is generally called the 'Capital of the country,' and we have come here to see the men who represent the government and where they carry on their business. Will Miss Gray tell us a little about the history of the government?"

"In the old Colonial times," said Miss Gray, "we were subject to England, and had governors sent to us from the mother country. But the Declaration of Independence, which was signed in Independence Hall, in the Old State House in Philadelphia, united the Colonies in an intense desire to separate from England and have a government of their own. The success of the Revolutionary War made possible this desire, and Articles of Confederation were adopted, but proved to be too weak to form a strong nation."

"In a few years a convention was called to consider the matter. They met in the State House, Philadelphia, early in 1787, but held most of their meetings with closed doors in Carpenter's Hall, a short distance from the State House, or Independence Hall. After four months of warm debate,

INDEPENDENCE HALL, PHILADELPHIA.

under Washington as president, the Fathers of the Republic prepared the Constitution, which was submitted to the States for their approval in September of that year. Having been adopted by the States, the new Constitution went into effect in March, 1789."

"Now, George, what can you tell us about the present government of the country?" Mr. Cartmell asked.

"The Constitution, about which Miss Gray has told us, enlarged by fifteen amendments, is still the supreme law of this Republic. I learned in my Civil Government last year that we have three departments in our form of government, — namely, the legislative, the executive, and the judicial."

"We saw to-day, Nellie," said her father, "the legislative department in the Senate and House of Representatives. To-morrow we shall see the other departments."

"The two legislative bodies," continued George, "are called Congress. This body has power to make laws which affect the dealing of our nation with other nations, such as making treaties of peace and regulations of foreign commerce. Congress also makes laws which affect all the States equally, such as the coining of money, the lighthouse service, the support and control of the army and navy, and the regulation of the postal service."

"We saw to-day," said Miss Gray, "that Congress consists of two bodies. Two senators are chosen from each State by the State legislature; they are chosen for six years, and it is so arranged that one third of them go out of office every two years. A senator must be thirty years of age. There are now eighty-eight senators.

"The House is composed of members who are chosen by the people for a term of two years. The number from a State depends upon the population. According to the last census every one hundred and seventy-four thousand people entitles the State to a representative. This gives Delaware and several other States only one each; Massachusetts has thirteen; Ohio, twenty-one; Illinois, twenty-two; Pennsylvania, thirty; and New York, thirty-four; the number of members in the House will be in 1893 three

hundred and fifty-six. A man can be a representative if he is twenty-five years old."

"I do not yet understand how laws are made, Papa," Florence said.

"You saw a small part of the work of making laws to-day. When we were in the Senate several *bills* were introduced and referred to the proper committees. When we were in the House a debate was going on in reference to a bill which had been favorably reported by a committee. After the House discusses the bill for a day or two, it will probably be put to vote. If a majority vote in its favor it will be sent to the Senate, and they will refer it to the Committee of the Whole; and then by and by that committee may report it favorably, when it will be discussed, and if a majority of the Senate vote in its favor it will be sent to the President for his signature."

"I should think it would take a long time for a bill to become a law," remarked Mrs. Cartmell.

"Thousands of bills are introduced at each session, but not over three hundred are enacted, — that is, become laws. Sometimes the President refuses to sign a bill, — which we call *vetoing* it. Then it may become a law if two thirds of each branch of Congress vote in its favor."

"What is the executive department?" Fred asked.

"The executive power is lodged in the President, who is chosen by electors for a term of four years."

"Why, Papa!" exclaimed Florence, "I thought every one voted for the President."

"No," answered Mr. Cartmell; "it was thought that if the people voted for electors, who should meet and elect the President, a more careful choice would be made than if he were elected by popular vote. Each State has

as many electors as it has representatives and senators combined.

"The duties of President are many and various: he is commander-in-chief of the army and navy; he must appoint foreign ministers and consuls, judges of the Supreme Court, besides a host of officers for different services throughout the country. With the advice of the Senate he makes treaties with foreign powers, and every bill that is passed requires his signature. In case of the death or disability of the President, his place is taken by the Vice-President, and in case of the removal of both of these officers the Secretary of State would fill the office."

"Is it true that any boy in the country may become President?"

"Not quite true, Fred. Citizenship and a certain number of years residence are required of any man who would be a candidate for public office; but the President must be an American by birth, must be thirty-five years old, and have resided for fourteen years in the United States."

"Do the same rules apply to the Vice-President?"

"Yes, the same qualifications are necessary, as he is liable to be called to serve in the higher office.

"The third department of the government is the judicial. This consists of a Supreme Court and such inferior courts as congress may see fit to establish. The Supreme Court is presided over by the chief-justice, who is assisted at present by eight associates."

LESSON XXIV.

ANOTHER DAY IN WASHINGTON.

THE next morning the Cartmells first took a ride about this **city of magnificent distances.** They drove through Pennsylvania Avenue towards the Capitol; then through New Jersey Avenue and on to the Navy Yard, returning by way of Massachusetts Avenue, and through that splendid street for a long distance, turning off to pass by the Pension Office, Patent Office, and Post Office Department; through New York Avenue to the United States Treasury building; by the White House and the State, War, and Navy Department. From the last they rode toward the river, and soon found themselves at the foot of the Washington Monument, having nearly completed a loop.

In this ride Mr. Cartmell explained how the streets all ran north and south, or east and west, while the avenues cross the streets diagonally, many of them radiating like the spokes of a wheel from the Capitol. The streets running north and south are numbered, the streets crossing these at right angles are lettered; the many avenues are named after the States of the Union.

They found that the two longest avenues were Pennsylvania and Massachusetts, and that each of these was one hundred and sixty feet wide. The former is the great business street and the main avenue of communication

between the Capitol and the White House; the latter is the handsomest in the city, and occupied by fine residences.

These avenues are all very wide, well graded and paved, ornamented with shade trees, and well lighted at night. The city has a great many squares, triangles, and circles, containing trees, shrubs, flowers, and statuary. These are generally found at the intersection of the avenues with other avenues or streets. Some of the striking statues seen were those of General Thomas, General Scott, and General McPherson, all represented on horseback; the statue of Emancipation, also seen in Boston; the statues of Admiral Farragut and General Washington, and those of Civilization and of Peace.

Of course when they came to the **Washington Monument**, on the banks of the Potomac, they wished to get out of the carriage and be carried in the elevator to the top. The elevator carried them up five hundred feet to the base of the apex, which is fifty-five feet higher. They learned that the monument was fifty-five feet square at the base and thirty-four feet square where they stood. The outside is built of marble blocks held together by mason work. The inside of the shaft is set with about one hundred blocks of stone, which have been presented by every important nation in the world as a tribute to Washington's memory.

The view from the top over the city, river, and surrounding country was fine. Miss Gray expressed the general feeling of her party when she said as they rode down: "This is a grand and stately monument to the memory of our immortal Washington. As its top towers above ordinary buildings on the earth, so the character of Washington towers above ordinary men."

In the afternoon the Cartmells visited first the large

and imposing building where the **Secretary of State**, the most important member of the President's Cabinet, has his office. This massive structure, is built after the Italian style, of Maine and Virginia granite. It has four grand entrances reached by broad flights of stone steps.

WASHINGTON MONUMENT.

CAPITOL.

STATE, WAR, AND NAVY DEPARTMENT.

The Secretary of War and his assistants occupy the northern and western side; the Secretary of the Navy, the eastern side; and the Secretary of State, the southern portion.

When Mr. Cartmell led his family into the interior of the building they were all delighted with its magnificent appearance They saw, as they walked about, wide stair-

cases of granite with bronze balusters, long corridors, and many rooms richly frescoed and adorned, each furnished with every convenience that could be thought of for the transaction of business.

While they were looking about, Mr. Cartmell happened to meet a friend who is one of the assistants to the Secretary of State, and he showed them through the Bureau of Indexes and Archives, where the papers of this department are carefully filed in such a way that they can be readily found when wanted; and where are also kept papers of the widest variety and character in reference to every country in the world.

He then conducted them into the finest room in the building, — the reception-room in which the Secretary meets officially the foreign ministers. It is sixty feet long and twenty wide; and finished in the Egyptian style, the floor covered with oriental rugs and the walls adorned with suitable paintings and busts. After leaving this room they went into the library on the third floor. This room they found made entirely of iron, wrought in graceful forms and adorned in pearl and gold tints. On the shelves are over thirty thousand volumes relating to law and history. They are in many languages.

"Now," said Nellie, "I hope we can go to the White House."

"Yes, we will do so, for it is only a few steps. Who can tell me the proper name for the President's house?"

"The **Executive Mansion**," George answered promptly.

"I will go with you," said Mr. Cartmell's friend, "so you may be sure to see the principal rooms, as it is not the regular hour for visitors."

"Thank you," said one and all.

They entered from Pennsylvania Avenue, through the main entrance door, shown in the upper picture. From the spacious vestibule they went into the great East Room on the left, which they found was designed in Grecian style, richly ornamented, with elegant mirrors on each side, and the lofty ceiling profusely decorated. A painting of Washington and one of his wife hang in this room.

WHITE HOUSE, WASHINGTON (FRONT VIEW).

REAR VIEW.

SMITHSONIAN INSTITUTION.

From the East Room they went next into the Green Room, in which all the furniture and decorations are

pale-green. The Blue Room is the next in order. In this the President receives his guests at public and private receptions. The room is oval, and is furnished in light-blue.

The last room they entered was the Red Room, where the President sits at night. This room is arranged like a family parlor; it contains books and magazines, has a picture of Lincoln above the mantel, and red plush furniture.

"Besides these rooms," said their guide, "is the State dining-room, in which the President gives ceremonious dinners, when the table is set with State china, masses of silver and cut glass, and special floral designs of exquisite beauty. Then the White House is brilliant with lights and music, with court costumes and beautiful toilets, with fair women and noble men.

"There are also the Cabinet Room in the second story, where the President meets the members of his Cabinet every Tuesday and Friday at noon, and the President's reception-room, where he receives those who call during the day on business or to pay respects."

"When is the President 'at home'?" Mr. Cartmell inquired.

"From ten A. M. to one P. M. on Wednesdays, Thursdays, and Fridays. Visitors are shown into a waiting-room at the head of the stairs. The President receives each person in turn. The usual form of address is 'Mr. President.'"

"Does the President have much to do?"

"Every morning his private secretary selects from the enormous mail the letters which it is necessary for the President to see, and turns the others over to clerks to

answer. Three hundred newspapers are received in each day's mail. A special clerk examines these and cuts out the articles he thinks the President would like to read. These cuttings he puts in a scrap-book, which is laid before the President every morning.

"At ten o'clock in the morning the President reads his letters, rapidly dictates answers to the least important, and puts aside the more important for the afternoon, when there will be more leisure to consider them. As soon as the correspondence is disposed of the visitors are admitted. They come from all parts of the country on all kinds of business, and keep him busy till luncheon time. In the afternoon the important letters and other questions of State fill up every moment till dinner is announced at seven o'clock. He usually has a few intimate friends at his table, and for a while banishes all care. After dinner follow more business or receptions, till at a late hour the President is able to retire to rest. Few men in the country work harder than the President."

Before leaving the White House Mr. Cartmell and his family were escorted to the portico in the rear of the house, from which they obtained a fine view of the extensive grounds and beautiful park sloping gradually to the river's bank. The Washington monument stood between them and the river, and beyond, toward the South, the shining waters of the Potomac against the blue hills of Virginia.

During the rest of their stay the Cartmells visited the **Smithsonian Institution**, situated between the great monument and the Capitol, and containing a fine collection of objects of natural history. Near the Institution they found the **National Museum**, which contains a large geological and industrial collection, besides many objects presented to it

at the close of the Centennial Exposition. They also visited the chamber in the Capitol where the Supreme Court sits, the Weather Bureau, National Observatory, Patent Office, Dead Letter Office, and Gallery of Art. The last day was given up to a delightful trip sixteen miles down the Potomac to Mount Vernon, the home and resting-place of the "Father of his country."

LESSON XXV.

POEMS.

THE last evening the Cartmells spent in Washington was rather cold and rainy, so they amused themselves by reading and reciting **poetry** in reference to the sections visited by them during the previous year.

First Nellie read a part of Isaac MacLellan's poem entitled "Maine."

"Far in the sunset's mellow glory,
Far in the daybreak's pearly bloom,
Fringed by ocean's foamy surges,
Belted in by woods of gloom,
Stretch thy soft, luxuriant borders,
Smile thy shores, in hill and plain,
Flower-enamelled, ocean-girdled,
Green-bright shores of Maine.

"Rivers of surpassing beauty
From thy hemlock woodlands flow, —
Androscoggin and Penobscot,
Saco, chilled by northern snow;
These from many a lowly valley,
Thick by pine-trees shadowed o'er,
Sparkling from their ice-cold tributes
To the surges of thy shore."

THE COAST OF MAINE.

Miss Gray referred to the poetical description of scenes "Upon our loftiest White Mountain Peak," by Lucy Larcom. One stanza in the poem reads: —

> "On widening vistas broader rifts unfold;
> Far off into the waters of Champlain
> Great sunset summits dip their flaming gold;
> There winds the dim Connecticut, a vein
> Of silver on aerial green; and here,
> The upland street of rural Bethlehem;
> And there, the roofs of Bethel. Azure-clear
> Shimmers the Androscoggin; like a gem
> Umbagog glistens; and Katahdin gleams
> Uncertain as a mountain seen in dreams."

Mrs. Cartmell spoke for Vermont, and gave an extract from Mrs. Dorr's tribute to that State: —

"Strong with the strength of thy verdant hills,
Fresh with the freshness of mountain rills,
Pure as the breath of the fragrant pine,
Glad with the gladness of youth divine,
Serenely thou sittest throned to-day
Where the free winds that round thee play
Rejoice in thy wave of sun-bright hair,
O thou, our glorious mother!
Rejoice in thy beautiful strength and say,
Earth holds not such another."

Fred gave for Massachusetts a few stanzas from Whittier's poem with the name of the State: —

"The South-land boasts its teeming cane,
The prairied West its heavy grain,
And sunset's radiant gates unfold
On rising marts and sands of gold!

"Rough, bleak, and hard, our little State
Is scant of soil, of limits strait;
Her yellow sands are sands alone,
Her only mines are ice and stone!

"Yet on her rocks, and on her sands,
And wintry hills, the schoolhouse stands,
And what her rugged soil denies,
The harvest of the mind supplies."

"Florence, what can you give us for Rhode Island?" her father inquired.

"I remember only one stanza from Miss Bates's poem:"

"Loved of all generous souls her Founder's name;
And forth from her what stalwart men have sprung!
Gallant in battle, eloquent of tongue,
Philanthropist and soldier give her fame."

George said he remembered part of a poem he once learned about Connecticut, written years ago by Fitz-Greene Halleck.

"And still her gray rocks tower above the sea
That murmurs at their feet, a conquered wave;
'T is a rough land of earth and stone and tree,
Where breathes no castled lord or cabined slave;
Where thoughts and tongues and hands are bold and free,
And friends will find a welcome, foes a grave;
And where none kneel, save when to Heaven they pray,
Not even then, unless in their own way."

Mr. Cartmell said that he was very much pleased with the excellent selections made for the six New England States. "It is rather difficult," he continued, "to represent in a few lines the many ideas which have been expressed by Bryant, Stedman, Butler, and other poets in reference to New York. My favorites are, Bryant's 'Hymn of the City,' beginning —

"'Not in the solitude
Alone may man commune with Heaven;'

Butler's 'Broadway,' in which the first stanza is —

"'On this day of brightest dawning,
Underneath each spreading awning,
Sheltered from the sun's fierce ray,
Come, and let us saunter gayly
With the crowd whose footsteps daily
Wear the sidewalks of Broadway.'

"Stedman's 'Pan in Wall Street' is so fine I do not dare to spoil it by a short quotation."

Miss Gray said at the end of the hour: "Few poems referring to this city and vicinity please me better than Bret Harte's 'Second Review of the Grand Army,' and David Humphrey's 'Mount Vernon.'"

"Can you give us a stanza from the latter?" Mrs. Cartmell asked.

"The first stanza is as follows: —

"'By broad Potomac's azure tide
Where Vernon's mount, in sylvan pride,
Displays its beauties far,
Great Washington, to peaceful shades,
Where no unhallowed wish invades,
Retired from fields of war.'"

APPENDIX.

A LIST OF POEMS.

CHILDREN are delighted to read or to hear read some simple poem referring to the section of country which they are studying. It adds variety to the geographical exercise and creates a love for the best in literature. The names and authors of a few poems especially appropriate for the study of the New England and Middle Atlantic States are here given. It will be noticed that most of these poems are written by such poets as Whittier, Longfellow, Holmes, Lowell, Bryant, Harte, and Stedman, and can be easily found in their works. All the poems referred to will be found in "Poems of Places," edited by Longfellow, volumes 25–28.

CONNECTICUT.

THE CAPTAIN'S DRUM . . . . . *B. F. Taylor.*
THE BIRDS OF KILLINGWORTH . . . . *Longfellow.*
THE PHANTOM SHIP . . . . . *Longfellow.*

DELAWARE.

PEACH-BLOSSOM . . . . . *Bayard Taylor.*
TO DELAWARE . . . . . *Whittier.*
THE FRESHET . . . . . *A. B. Street.*

MAINE.

THE WATCH OF BOONE ISLAND . . . *Celia Thaxter.*
TO A PINE TREE ON KATAHDIN . . . *Lowell.*
PENOBSCOT BAY . . . . . *Whittier.*

MASSACHUSETTS.

NEW HAMPSHIRE.

NEW JERSEY.

NEW YORK.

PENNSYLVANIA.

RHODE ISLAND.

VERMONT.

BOOKS CONSULTED.

MANY books have been consulted in the preparation of Part I., but the author feels especially indebted to the following books for valuable assistance. To them teachers and pupils are referred for further information.

CIVIL GOVERNMENT OF THE UNITED STATES	*John Fiske.*
STUDIES IN CIVIL GOVERNMENT	*W. A. Mowry.*
OUR COUNTRY	*J. Strong.*
AN EASTERN TOUR	*Cook.*
IMPRESSIONS OF AMERICA	*Freeman.*
THE ART OF LEATHER MANUFACTURING	*Alex. Watt.*
BURLINGTON ILLUSTRATED.	
VERMONT ILLUSTRATED.	
ST. JOHNSBURY ILLUSTRATED	*A. F. Stone.*
GREAT INDUSTRIES.	
THE WATCH FACTORIES OF AMERICA	*H. G. Abbott.*
CLOCK AND WATCH MAKING	*E. B. Denison.*
CURIOSITIES OF CLOCKS AND WATCHES	*E. J. Wood.*
HAND-BOOK OF BOSTON	*Moses King.*
THE BOOK	*Bauchot.*
PRACTICAL PRINTING	*J. Southward.*
PRINTING MACHINES	*Wilson.*
THE ANDROSCOGGIN LAKES	*C. A. J. Farrar.*
MOOSEHEAD LAKE	*C. A. J. Farrar.*
WOODS AND LAKES IN MAINE	*Hubbard.*
LIFE IN THE MAINE WOODS	*J. Neal.*
THE MAINE WOODS	*Thoreau.*

AMERICAN WEATHER . . . . . *A. W. Greely.*
INSTRUCTIONS FOR THE SIGNAL SERVICE.
PHYSICS . . . . . *Deschanel.*
THE ELECTRIC TELEPHONE . . . . . *G. B. Prescott.*
COMMERCIAL AND RAILWAY TELEGRAPHY *J. P. Abernethy.*
DICTIONARY OF NEW YORK.
COMMERCE AND NAVIGATION OF THE UNITED STATES . . . . . *Treasury Department.*
WOOLLEN AND WORSTED CLOTH MANUFACTURES . . . . . *Beaumont.*
WASHINGTON . . . . . *Townshend.*
PICTURESQUE WASHINGTON . . . . . *J. W. Moore.*
GREAT CITIES OF THE MODERN WORLD *H. Shepard.*
AMERICA ILLUSTRATED . . . . . *Williams.*
POEMS OF PLACES . . . . . *Longfellow.*
THE VARIOUS MAGAZINES.

INDEX.